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The Registration of Contractors.

THE National Register of Electrical Installation Contractors continues to make progress, as will be seen from the report which appears elsewhere in this issue. It is not known exactly how many electrical contractors there are in this country—the number has been estimated at 7,000—but there is no doubt that a fair proportion of them are now registered. It is noteworthy that the number of registered contractors (1,318) exceeds the membership of the E.C.A. There must, however, still be far more outside the Register than are on it, and, moreover, with the growth of the industry there must be a constant influx of men into the installation business—good, bad and indifferent. The good ones must be persuaded that registration is to their advantage, the bad ones must be put out of business, and the indifferent ones made to mend their ways. This is the problem which faces the Register if it is to become a fully-recognised authority.

There is no doubt that so far the Register, in six years, has not reached that position which it set out to attain, and it is questionable whether it is going ahead fast enough. It needs a measure of sustained publicity which its present income is insufficient to provide; therefore its immediate necessity is more money. Steps are to be taken to increase the income by doubling the annual renewal fee, but as the principal object of this is to finance an inspection service the position as regards publicity will remain unaltered. An alternative way of improving the revenue is to increase the number of registrations, but this postulates greater propaganda or greater support by some of the bodies represented on the Registration Board. The first is evidently out of the question if the Register is already doing what it can with the limited means available; it remains, therefore, to discover how much can be done in the second direction. The greatest power lies with the electricity supply authorities. A considerable number of them have instituted assisted-wiring schemes, and eventually they will all have to do something of the kind. This means that collectively they have the allocation of a vast amount of installation work. How many of them really worry about the standard of that work? In other words, how many protect themselves by confining contracts to registered contractors? The reports of the Register have indicated that there are very few of them, and the last report shows no specific additions to the list.

It is admitted that a supply authority's aim is to sell more and more energy and that it will therefore be disposed to give its installation work to the lowest tenderer, thinking that low prices mean more new connections. Ultra low prices are usually synonymous with bad value, and cheap installations may prove a very poor advertisement for electrical service. The difference in the cost per point between good and bad work is usually small and in any event is outweighed by other considerations. Surely in these circumstances supply authorities would be well advised to pay a fair price and secure a guarantee of good work, which means that they should support the Register by honouring its certificates.

From the geographical list of members published by the Register the towns in which registration is required by the local authority can clearly be seen. The list has another outstanding feature—many towns of considerable size are not represented at all, while many others are credited with only one or two registered contractors. It seems to us that the heavy artillery of the Register should be brought to bear upon these towns to break down the obstacles of "high costs" and local political considerations and bring the authorities to realise the wisdom of placing their electrical work with men whose abilities are vouched for.

Compulsory registration is a very remote ideal, or, as some think, contingency. The form of beneficent coercion which we have indicated is the next best thing as it will work good to the contractor, the supply authority, the public, and the industry as a whole.

Consulting engineers, architects, and builders must be persuaded to follow the same line, and in addition the public must be constantly told what the Register means to them. This latter work, we think, should be the duty of the registered contractors themselves in their own localities. We have already seen many co-operative advertisements by registered contractors who realise that the maintenance of the status of their industry is their common concern. It is an idea worthy of extension.

We repeat, in conclusion, that more remains to be done by the bodies represented on the Register; the Executive Committee should be free to deal with registration matters and to guide policy, rather than be saddled with publicity and development work which is better done locally.

Electricity Supply Metering.

THAT the highly technical problems associated with electricity supply metering, particularly large-scale or bulk-supply work, involving such issues as metering at high voltages, low-pressure measurement with adjustment for transformation losses, and summation recording, are gradually being unfolded is evidenced by the excellent papers which have been read recently before the Meter and Instrument Section of the Institution of Electrical Engineers, and formerly by the same body during its separate existence as the Meter Engineers' Technical Association. It is far from our intention to deprecate the great value of such work, but we suggest that what is perhaps of greater importance is the need for arrangements which are not likely to prove irksome to the consumer.

It is often "good business" not to adhere too strictly to the business method in its limited technical or more narrow sense. The "psychological reasoning" of the consumer will always remain an obstacle, and a satisfactory answer, from the consumer's point of view, to the question "Why should I pay rent for apparatus which is of no service value to me?" will probably never be given. Several undertakings have recently abolished meter rents, wholly or partly, notable examples of which are Kingston-upon-Hull, Stoke Newington, and Hastings.

We were interested recently in a well-known supply engineer's account of his controversy with a "savage man" over the metering question. The consumer could not see why he should pay meter rent in any form, but he was quite pleased with the arrangement made that he should buy his meter; he paid well too. It is not every consumer who will pay well for his meter, but the instance serves to illustrate the complexity of the problem.

We record in this issue what appears to be an excellent arrangement between a supply undertaking and a consumer to overcome the vexed question of large-scale metering. We refer to the agreement between the North Metropolitan Electric Power Supply Co. and the Associated Equipment Co., Ltd., whereby the cost of the metering equipment is borne equally by the supply company and the consumer, who will also bear equally the cost of repairs to the apparatus in question. Another particularly interesting arrangement between the supply undertaking and the consumer in question is that by which the consumer obtains a rebate of 15 per cent. on the secondary charge as the result of taking the supply direct at the transmission pressure (22,000 V).

"Special arrangements" are fostered by "special reasons" which are not our concern, but 15 per cent. on a consumption of six million kWh amounts to a very appreciable figure, which, although it has, no doubt, some bearing on the cost of the transformers, switchgear, &c., from which the supplier is freed, represents a considerable departure from the usual business formula.

Applications of Electricity.

THE variety to be found in some of the electrical equipment put on the market in the last few months shows very clearly how wide is the field in which electricity may be applied with profit. Apart from the multitude of more or less conventional devices that are constantly being sold, we have noticed such diverse electrical applications as etching, steaming hats, air purifying, fire fighting, testing airship gases, and aiding mine prospectors. Certainly the utility of electrical methods is gradually being realised by the electrical public, just as domestic consumers seem at last to be aware that a simple way of saving themselves labour and dirt is at their disposal if they will only reach out and take it.

We feel, however, that a great many useful applications of electricity remain undeveloped—merely because their possibilities have not been properly investigated. It is only necessary to examine some of London's embryonic buildings to see what opportunities are being neglected; frequently no sign of electrification is found beyond lamps and telephones. Surely it is time the electrically-operated concrete mixer and the electric crane came into their own, and there are dozens of other ways in which electrical energy can accelerate building processes. It is true that some supply authorities are still reluctant to bring cables to sites where no buildings yet exist, but they are bound to learn sooner or later that enterprise is nearly always repaid in the long run, though it may be indirectly.

Coal Carbonisation at Dunston.

THE Department of Scientific and Industrial Research, in pursuance of its powers to test, at the public expense, plant for the low-temperature carbonisation of bituminous coal, has carried out a test on the plant installed at Dunston. The Department, which confines its investigations to technical aspects, has now issued its report, extracts from which are given in our "Notes" section this week.

This plant was described in a paper read before the I.E.E. last autumn by Messrs. E. H. Smythe and E. G. Weeks, and reported in our issue of November 29th; it is of especial interest to electrical engineers, since it differs essentially from other plant in being used by a statutory supply authority, the Newcastle-upon-Tyne Electric Supply Co., for the production of electricity through the medium of steam. The coal distilled is uncleaned "smalls" from Northumbrian pits; such as would be used in the ordinary way with stoker-fired boilers; this is a strong point in its favour. In view of the importance of the efficient utilisation of fuel, it is gratifying to learn from the report that the plant worked quite satisfactorily and that the claims made as to throughput and yields are officially substantiated.

The Next Ten Years.

The author again stresses the enormous field which lies before the electrical industry, particularly in the home, and deprecates excessive standardisation of the design and application of electricity, which, he says, possesses much greater "flexibility" than gas. He returns to the subject of co-operation through a National Council of the Industry in which the best brains would participate.

By H. WILLOUGHBY-ELLIS, A.M.I.E.E.
President, the Electrical Contractors' Association (Incorporated).

IT is said that there is wisdom in a multitude of counsellors; but the gentlemen who, some years ago, sought to build a tower to heaven, also discovered that chaos reigned in a multitude of tongues. Despite these conflicting emotions, the valuable articles that have appeared in recent issues of the ELECTRICAL REVIEW discussing electrical prospects during the next ten years, and examining ways and means of securing vigorous, but none the less ordered, trading progress and conditions within the electrical industry, have been read with the greatest interest. On the other hand, I feel that I have been listening to a spirited academic debate which has left my own convictions precisely where they were.

What are the practical considerations and facts that face each one of us at the present moment? We have a service that may be applied with advantage to every human requirement and every human activity. In addition to this, we have in prospect a national scheme which is designed to place that service, in a standardised form and at economic rates, freely at the disposal of nine-tenths of the entire community. The immediate need and, indeed, the only problem before us, is, therefore, so to organise the industry that every human electrical requirement is met in a sensible and economic manner, with the least possible delay, and to the best advantage of all concerned, trade and public alike. Looking, once again, at things as they are, what do we find? Surely we shall discover (1) that the electrical industrial situation is absolutely secure; and (2) that the electrical domestic situation has been no more than scratched on the surface. On the larger issues, for example, the question of railway electrification must be settled by a relatively small body of competent experts who, with the engineering and economic facts before them, will proceed either quickly, or cautiously, with the solution of this major problem. So far as industrial electrification is concerned, this question will be settled by a larger and less homogeneous body of experts who will proceed to find an ever-growing load for the grid, based on the vast accumulation of engineering and economic data relating to their own or similar industries, backed up by the wide industrial experience already in their possession. So far as domestic electrification is concerned, however, we find a vast field presenting totally different characteristics. The progress of domestic electrification will be determined not by engineering and economic experts, but by ordinary men and ordinary women whose electrical understanding and appreciation, with all proper respect, and in no spirit of superiority whatever, is simply a minus quantity.

Lafayette] [*London.*

Mr. H. Willoughby-Ellis.

On the one hand, we have large fields that are to be cultivated as a direct consequence of engineering and economic conference; and on the other hand, we have an immensely vast field—and I would put electro-agriculture in the same category—that is to be cultivated by electrical mass education and by that individual confidence which can be achieved only by personal contact. In other words, the major and overwhelming problem confronting all electrical men is provided by the problem of domestic electrification. Other fields are already assured, and will develop themselves either quickly or at greater leisure, depending very largely upon the economic pressure experienced in each division.

Now on top of all this we are advised that the sphere of many central station engineers will be severely modified. Under the grid, many of these engineers are to be relieved of the cares of generation, and they are to concern themselves solely with questions of distribution and salesmanship. And, because of this change of occupation—imposed, as we are told, upon a body of somewhat unwilling men—we are further advised that the days of the electrical contractor are numbered. Instead of thirty or forty electrical contractors endeavouring to maintain personal touch with the public in any particular area, one man is destined to take over this work and to carry on with greater effect, and enhanced benefit,

to all concerned. To express the matter in this way seems to me to expose the fundamental error of this outlook. If it is a fact, as I suggest, that the domestic field is all-important, and if it is a fact that this field must be developed by mass education and by personal contact and confidence (again as I suggest) then how is this to be achieved in any fairly large area by one centralised and bureaucratic department?

Take the question of domestic hot-water supplies—a vastly important matter both from the consumer's point of view and, because of its admirable load-factor, from the electrical point of view as well. Is this immense plumbing business to be handled from one centralised electricity supply office? Those who foresee an immense simplification and standardisation of domestic electrical service are thinking, it seems to me, in lighting terms alone. If electricity was a lighting agent, and naught else but a lighting agent, then it would not be difficult to imagine a centralised organisation dealing, single-handed, with the supply and installation of that service. But, even so, if we visualise not 25 per cent., but 75 per cent. of houses *lighted* by electricity, let us attempt to picture the immense private trade, even in lamps and fittings, that would be done in this branch alone. If now, and with considerable generosity, we regard lighting as representing one-third of the business, let us attempt to estimate the complicated and multitudinous character of the remaining two-thirds of the domestic story; and let us also attempt to visualise that immense business, in any single area, falling under the care of a central organisation.

It is a besetting sin of electrical engineers that they are only too willing to look at future possibilities through the wrong end of the telescope. It is a deplorable thing to say, but the majority of electrical men are not themselves converted, even to-day, to the electro-domestic point of view. With little or no personal experience, they fail to appreciate its possibilities, and they persistently under-rate its potentialities. Taking a narrow, if not pessimistic, view of their service, they foresee the industry reduced to the level of its principal competitor—limited to a few pieces of standard equipment and with everybody content to take uniform, mass-produced supplies, prepared by a limited number of big manufacturers, and supplied from one local and centralised store. Frankly, I cannot see this limiting and concentrating movement taking place within any reasonable period of years. The whole history and evolution of the use of electricity leads me in a contrary direction. Are we within sight of the end of electrical development in the matter of design and application? In the old-established field of lighting are we not, at the present moment, in the very midst of fundamental upheavals in both directions? In the matter of our lighting fittings alone, have we reached finality? At the present moment, as I say, we have no more than scratched the surface of the domestic demand; and when we have not only scratched the surface, but ploughed and fertilised this field to some appreciable extent, it will not be fewer electrical centres of service that will be required, but more and more, and better and better, centres of such service.

Changes I certainly foresee. I can appreciate the possibility of large installation companies operating successfully in particular areas; but I also foresee the development of many *specialist* electrical firms able to deal with the peculiar electrical requirements of individual trades and industries, and even with particular domestic requirements. Indeed, I have already referred to the big question of domestic hot water.

Just one question on an associated problem. What would our principal competitors give to-day to find themselves surrounded by a live body of independent gasfitters, gas salesmen, and gas showrooms to support the industry in its hour of need? No matter how large this auxiliary army might have been, electrical progress could not have been checked indefinitely; but the final day of reckoning, when the gas industry will definitely take second place, might have been substantially delayed.

One other cognate point. Our principal competitor supplies a commodity through a pipe system rigidly fixed to larger or smaller burners capable of producing one type of simple gaseous "fire" which, in turn, is capable of providing a light, boiling a kettle, or heating a room. Because of this cast-iron simplicity, the gas industry found it possible to concentrate the whole of its service in centralised organisations. True enough, that very simplicity of service has been its strength; but, paradoxical as it may sound, it will be its undoing. Times change, and ideas with them. The very flexibility of our own service, its variety, its capacity to go anywhere and do anything, will be the principal factor in diverting public allegiance from a cast-iron—in more senses than one—and immobile service, and attaching that allegiance to an infinitely better, more mobile, and more widely useful and convenient service. But this very variety and mobility, as I have endeavoured to show, will exercise a direct reaction on the methods whereby that service will be placed at the disposal of humanity.

So far as the electrical education of the public is concerned, I shall have little to say on the present occasion. As already indicated, this is a question of the greatest magnitude and the most singular importance; but, having no desire to pose either as a publicity or educational authority, I must leave others to devise the most effective means to achieve these ends. Simply as an electrical engineer, with no more than one eye on the possibilities of the next ten years, I will rest content after emphasising, once again, their supreme importance.

So much for one or two aspects of the matters that have been discussed with such vigour in recent issues of the ELECTRICAL REVIEW. When, however, I turn to the trading side of the story, I can discover only one basic need, and that is for organisation, and yet more organisation, within our ranks. Here, again, the very broadest views are necessary. As somebody or other said recently, we are not attempting to pass on to the public an indifferent commodity, and indifferent service, at any old price we can obtain. On the contrary, we are promoting a service designed to change and uplift the whole human scheme and art of working and living; and yet, in our desperate anxiety to obtain business at any price, we behave as though we were marketing a product which, at any moment, might be swept aside as a vain and useless thing. Now the only cure for this electrical business myopy, if not madness, is, as I say, increased co-operative organisation within the industry, whereby each man and each section, shall give of his and their best, to achieve the immense changes and reforms we have in view.

It simply amounts to this. We *must* recognise that the "best" cannot be fostered and cannot be given unless or until the responsible leaders in all sections of the industry get together and formulate mutual schemes of support whereby progress may be achieved on a sound basis of adequate remuneration for services rendered, coupled with business security and stability for all the useful units engaged in this immense work. One of your contributors has referred to an "Electrical Appliances Marketing Board." I care not in the least what name we may attach to any principle of co-operative common sense that may be proposed. The scheme already referred to may be worthy of careful consideration. I, personally, have urged the preparation of a "National Electrical Trading Register" as providing another means to the same end of ordered electrical trading; and above all I have urged the creation of a National Council of the Industry which shall discuss ways and means to apply any such schemes to the public welfare and our own general good.

And that, surely, is the crux of the whole question before us. If we cannot find a great electrical leader, if we cannot find a man—I must not call him a dictator—with the mental equipment and personality to lead a united electrical industry through the great and strenuous years that lie immediately ahead, and at least let us gather together the best brains that we can find and persuade those gentlemen to advise, direct, and unify our present hesitant and disjointed efforts.

A Large Workshop Scheme.

Many novel features and excellent examples of good workmanship are embodied in the electrical installation at the works at Southall, Middlesex, of the Associated Equipment Co., Ltd.

ONE of the best examples of electrical installations for ordinary power driving, &c., in large workshops that it has been our privilege to inspect is that at the Southall, Middlesex, works of the Associated Equipment Co., Ltd., in which the bulk of the engines and chassis of the vehicles for London's 'bus services, and also the services of other large centres, are manufactured. The general scheme represents a high standard of workmanship, without extravagance; indeed the policy followed by the electrical department a few years back, when the works were first established, and when the company moved from its old factory at Walthamstow, of leaving ample margin for development has already proved to be an economical one. The installation is a large one, over 3,500 h.p. of motor capacity being installed. Nearly six million kWh were consumed in the works last year. Electricity is received at the works from the North Metropolitan Electric Power Supply Co. at 22,000 V, at which pressure it is taken charge of by the A.E.C. and transformed down by the consumer to 415 V, 3-phase. A steel-cubicle receiving switchboard includes, *inter alia*, the supply company's metering transformer equipment, and the consumer's main switchgear, fig. 2. The actual metering is effected by suitable equipment on a separate board, and the cost of the apparatus is borne equally by the supply company and the consumer. By special arrangement also the costs of repairs to the metering equipment will be borne equally by the two parties in question. It is of interest to note that as the result of the consumer taking the supply direct at the

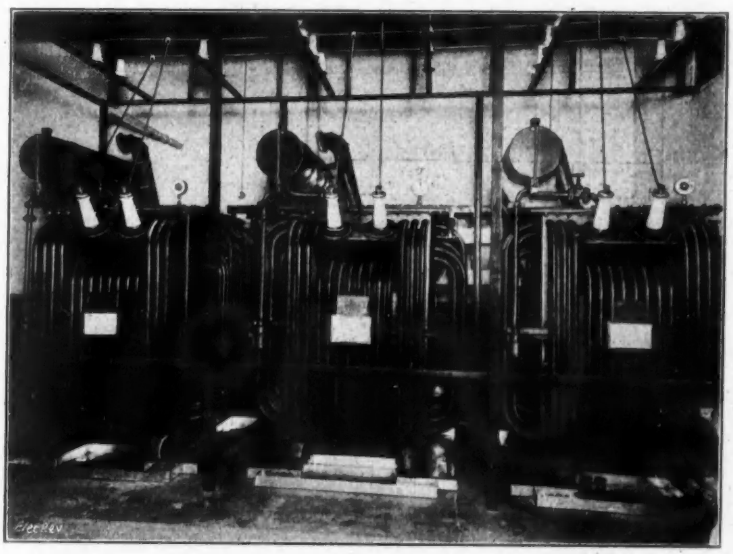


Fig. 1.—Supply Transformer Bank, H.V. Side.

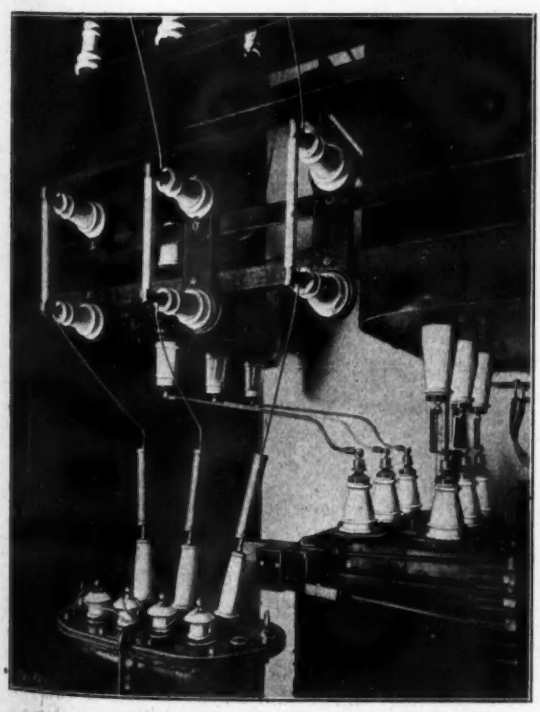


Fig. 2.—The Main (Consumer's) Switchgear, 22,000 V.

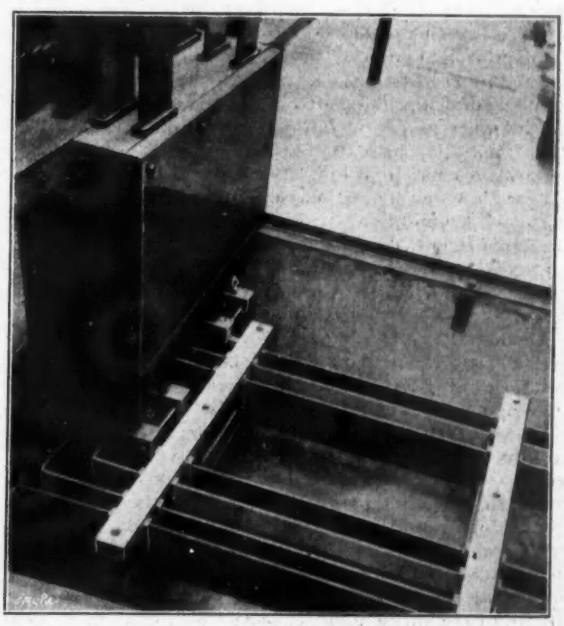


Fig. 3.—Heavy Copper Connections from Transformer to Switchboard.

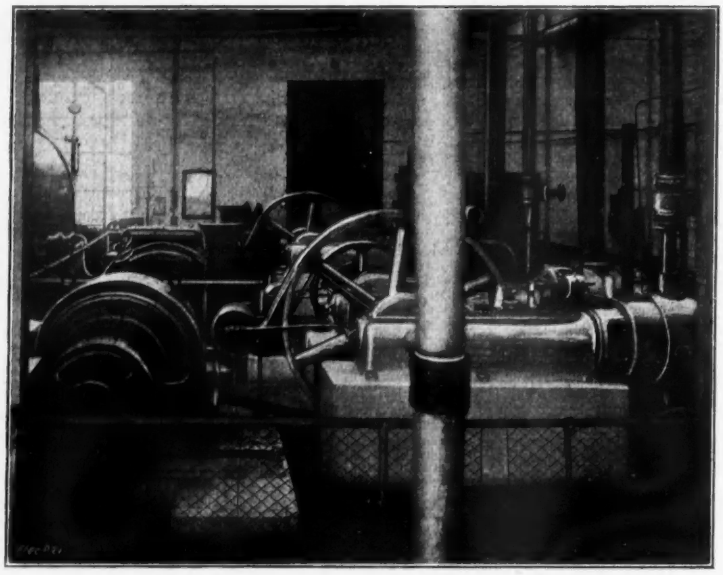


Fig. 4.—Auto-synchronous Motors driving Air Compressors.

transmission pressure, a rebate of 15 per cent. on the kWh charge is granted by the supply company. The consumer's oil switch is fitted with a time-load relay on each phase. It has a rupturing capacity of 130,000 kVA, and it was manufactured by the Fuller Electrical Co., Ltd. The pressure is reduced in an adjacent room by means of three single-phase 833-kVA transformers by the British Thomson-Houston Co., Ltd. These are oil cooled and fitted with calcium breathers and conservatoire tanks. Figs. 1 and 5 show the transformers and connections on the high-voltage and low-voltage sides, respectively. The particularly neat connections in both cases are worthy of note. The h.v. connections are $\frac{1}{2}$-in. copper rods (round), and the heavy l.p. busbars are constructed of 6-in. by $\frac{3}{8}$-in. copper plate. In order to stop leakage of compound from the terminal bushes, as the result of vibration, flexible connections, fig. 5, have been inserted on the l.v. side. A fourth transformer acts as a stand-by. The copper-plate connections are taken by way of a trench to the switchroom nearby, fig. 10. This affords a splendid example of heavy busbar work, and is depicted in fig. 3.

The main distribution switchboard, B.T.-H. fig. 10, is about 57 ft. long and consists of 17 t.p., 500-A panels for power, and 12 s.p., 400-A panels for lighting, in addition to a panel with a main tandem t.p. oil-immersed switch and one with a sub-main 1,000-A t.p. switch for lighting. This board is of the open slate-panel type, and it is equipped with a Murday instrument for recording both volts and amperes. The back of the board is covered in with glass panels to protect the equipment from dust. From each power panel a 0.6-sq. in. t.p., l.c. cable is taken to one of 17 ironclad distribution boards situated at various points throughout the factory. Similarly, from the lighting panels 0.25-sq. in. cables feed ironclad distribution boards suitably placed in the works. The cables terminate in "Henley" pot-heads. The factory proper is one large room covering a floor area of some 369,000 sq. ft. The cables from the main switchboard are laid in ducts underground to a central junction pit from which they radiate in various directions to the points of usage.

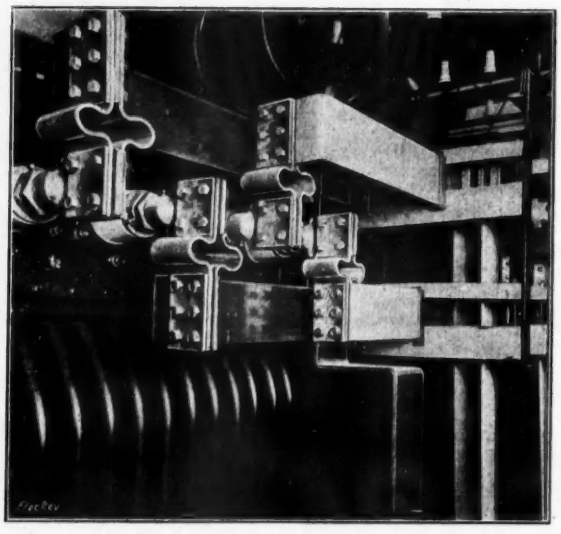


Fig. 5.—L.V. Connections of Main Transformers.

Practically unity power factor is maintained for the installation by means of several auto-synchronous motors. Fig. 4 shows an interesting group of three such machines driving air compressors. They are each of 120 h.p., pipe ventilated, with belt and jockey-pulley driving. There are also two 250-kW motor-generator sets which are specially wound for power-factor correction. These furnish a d.c. supply for testing engines on load, and, as in the case of air-compressor machines, they were supplied by the

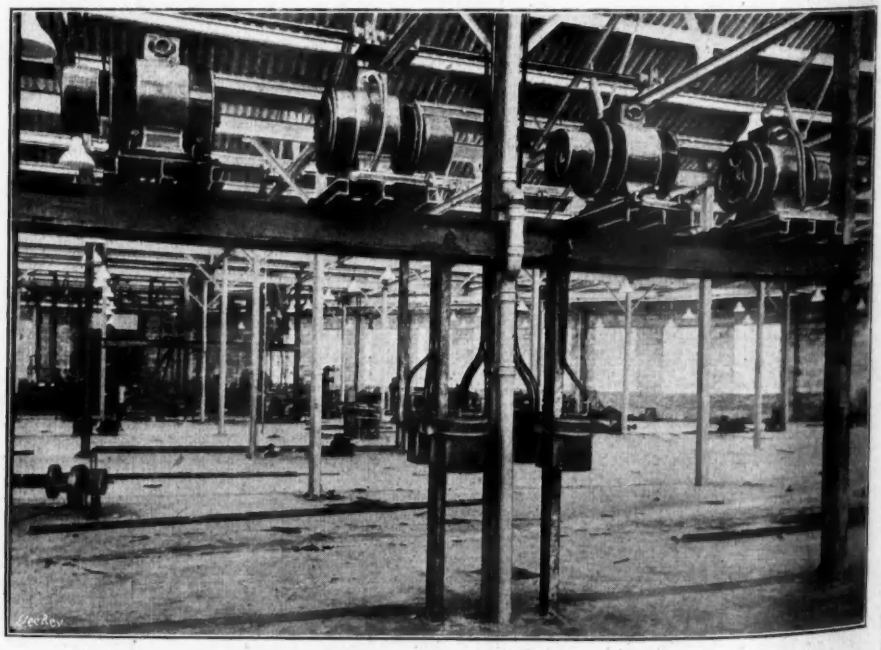


Fig. 6.—A Factory-drive Motor Group; 30-h.p. Motors.

A.S.E.A. Co. Fig. 11 is a typical example of the factory power distribution boards, which were supplied by Verity's, Ltd. Each board has 12 ways, each way being equipped with three links; v.i.r. 19/18 cables are carried from the "dis-boards" to the motors in solid-drawn screwed steel tubing, permanent continuity at the "dis-board" ends being provided by direct screw-in connections, and at the motor ends by flexible metallic tubing. The tubing is standardised throughout the works at $1\frac{1}{4}$ in. and $\frac{3}{4}$ in. The lighting distribution boards are of the 60-A, d.p., 6-way type, and were supplied by Veritys, Ltd. From these boards 7/16 v.i.r. cables feed 8-way, 10-A, d.p. switchboards, supplied by Messrs. Parmiter, Hope & Sugden, Ltd., disposed throughout the works. Over each lighting switch position there is an illuminated indicator, "Lighting Switches." These indicators are always "on," being wired off the mains direct. Similarly a "Fire Extinguisher" indicator is placed over each hydrant.

A standard system of driving for the ordinary workshop power of the heavier class employs groups of four 30-h.p. motors mounted on gantries in the girderwork overhead. Fig. 6 depicts one of the power drives. The motors are squirrel-cage machines, all specially mica insulated, and in practically all cases they were supplied by the English Electric Co., Ltd. The motors, which are governed by Erskine Heap starters of the star-delta type, fitted with two overload and one no-volt coils, belt-drive various lines of shafting which serve all manner of machine-shop equipment, drills, lathes, planers, and so on.

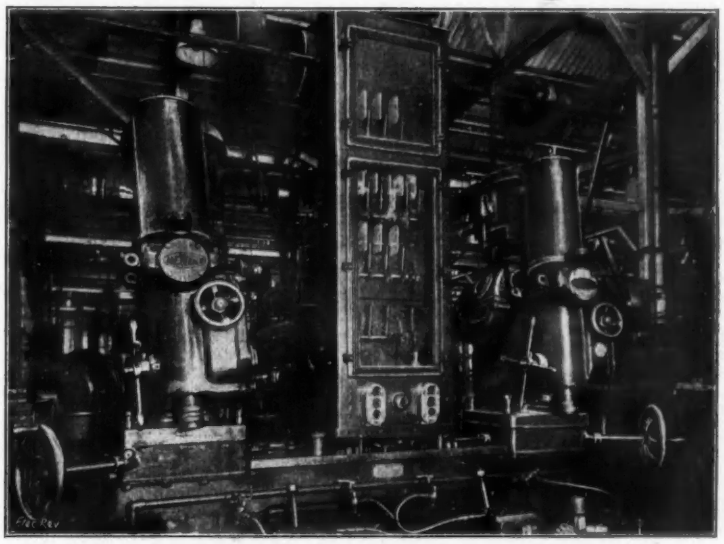


Fig. 7.—Five-motor Axle-drilling Machine.

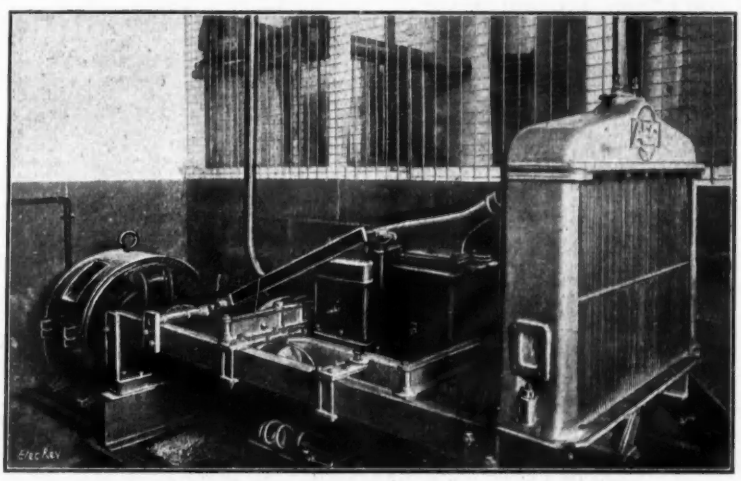


Fig. 8.—Emergency Lighting Set; 45-h.p. A.E.C. Engine.

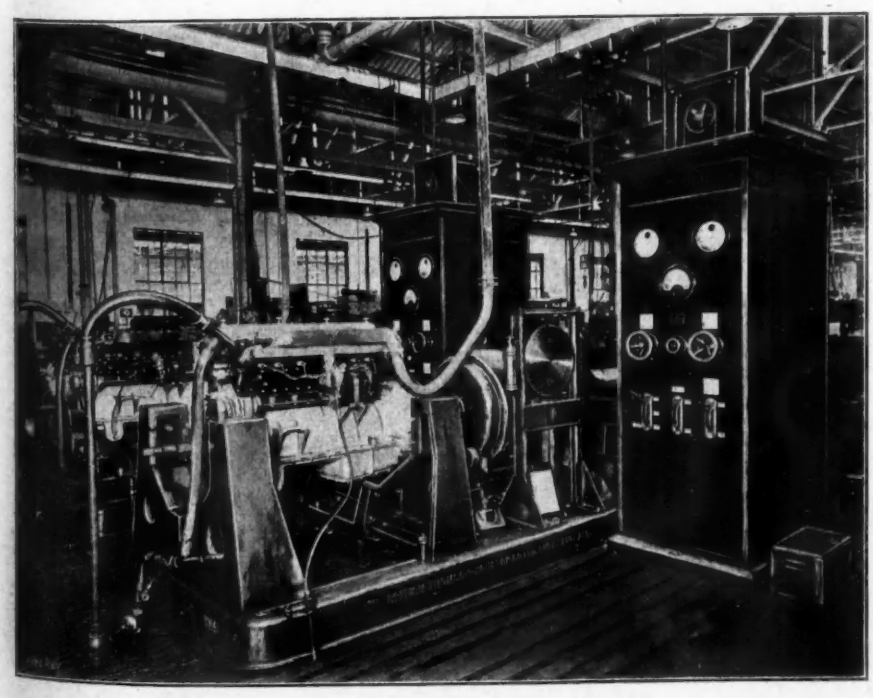


Fig. 9.—Engine-testing Dynamometer Sets.

A "colour scheme" prevails throughout the installation, various types of electrical equipment being painted in distinguishing colours. For instance, all the d.c. fuseboards and boxes in the factory proper are painted blue, the push-buttons on all machines are yellow, and the lighting switches are also painted yellow.

A feature of the works "process" equipment is a travelling cradle on which chassis are built up. This stretches the whole length of one side of the shop, some 225 ft., and receives the various parts for assembly, in the correct sequence, from working lines normal to itself as it travels along. The platform runs on the endless-chain principle, and is driven by a 5-h.p. motor. At the "finish" end, however, there is a drum, the external surface of which forms a continua-

tion of the platform. This drum is driven by a 30-h.p motor and is used to give each chassis a "send off" from the platform, at the same time starting up the engine. Smaller conveyors are employed at different parts of the works for the varying processes, all electrically driven, of course, and there is also an efficient service of overhead runways.

Included in the many testing outfits which may be seen during a tour of the factory are four dynamometer machines of 120 h.p., which were specially designed for the company by A.S.E.A. These machines are employed for the application of endurance and speed tests to automobile engines to which they are directly coupled. At first the machines motor the engines, and then the engines take up the load and drive the machines at 460 V, d.c. The motoring is done at 230 V. The energy generated by the machines is fed into the bus-bars for the common d.c. supply for the works. The dynamometers are arranged in pairs with the switchboard between them. Fig. 9 shows a typical dynamometer group with a couple of engines on test. The general d.c. supply for the works is furnished at 460 V by means of a couple of 250-kW motor-generator sets installed in the switchroom, while a 230-V supply for testing work is obtained by means of a B.T.-H. balancer. We were informed that the latter machine had been running almost continuously for 14 years, and that the commutator had never been re-turned. A small motor-generator serves for the d.c. supply to the magnetic tables. An eight-panel open-type slate switchboard controls the d.c. incoming and outgoing supplies. Four other sets (B.T.-H.), 900 to 2,000 r.p.m., 40 kW, supply into the common d.c. bus-bars.

Fig. 10.—Switchroom; Main Board Left, D.C. Board and Machines Right.

An experimental section is also equipped with a number of dynamometer engine-testing machines. One set employs a 64-kW G.E.C. (America) machine, the energy from which is dissipated by means of resistance. This machine has a speed variation of from 1,050 to 4,000 r.p.m.

At all parts of the factory are to be found special-purpose machines, usually specially made for the company, and in these cases separate and specially-designed driving arrangements are installed. A surface grinder is equipped with a 24-in. magnetic plate which is loaded at 0.8-A, d.c. The machine is driven by a 30-h.p. directly-coupled motor. An "Archdale" drilling machine, fig. 7 is equipped with five motors, four for drilling and one for raising and lowering the table. The latter is a 5-h.p. motor. Two 6-h.p., two-speed motors

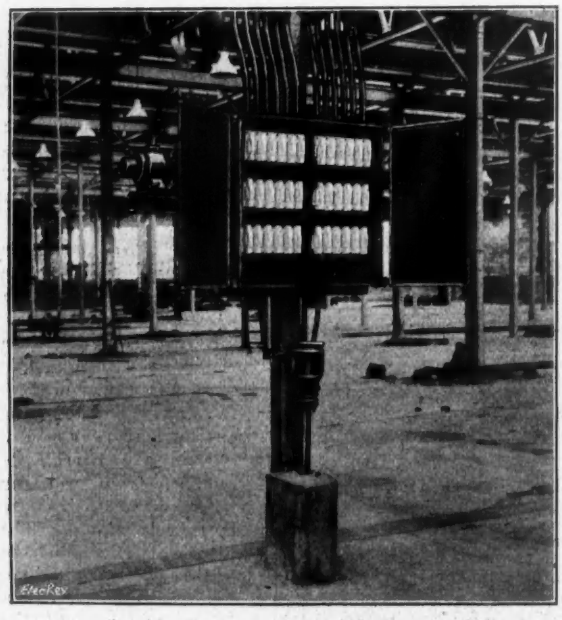


Fig. 11.—Typical Factory Distribution Board.

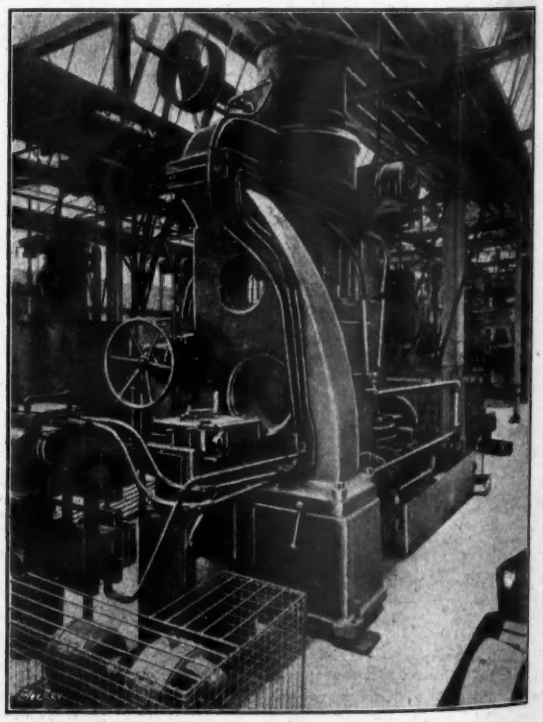


Fig. 12.—Vertical Grinding Machine; 72-in. Magnetic Table.

drill downwards, and two 3-h.p. motors drill upwards. An "Empire" control panel of Electric Control, Ltd., governs the supply to this machine. Fig. 12 shows a "Lumsden" vertical grinding machine which is equipped with a 72-in. magnetic table. A 60-h.p. vertical motor drives the grinding wheel, while a 4-h.p. motor serves for lifting and lowering the table; this motor is carried on a bracket beside the vertical motor. A 6-h.p. motor, on the girder overhead, operates the necessary pumps for lubricating purposes. The large motor is controlled by an auto-transformer starter, and the table-raising and lowering motor is served by a reversing motor. The small machine shown at the left bottom, Fig. 12, is a motor-generator which was installed as a temporary means of giving a d.c. supply for the magnet coils. The whole machine weighs 15 tons.

Fig. 13.—An Example of the Office Lighting.

Fig. 14.—A Night View in the Factory.

A particularly interesting piece of equipment is a "Wellman Smith" furnace-charger for serving case-hardening furnaces with material. As will be noted from the illustration, fig. 15, this machine is in the form of an overhead travelling crane. It is equipped with three motors, two of 3 h.p. and one of 5 h.p., for the two travelling directions and the raising and lowering motion. Each motor is served by a reversing controller.

Particularly happy results have been obtained by the company's electrical department in connection with the lighting of the premises, both in the offices and the factory. Very practical measures were taken in deciding what system to adopt, the opinion of the work-people being taken as to the lighting effects resulting from various types of equipment, sizes of lamps, dispositions of points, and so on. Figs. 13 and 14 are typical examples of the office and works lighting, respectively. In the offices Siemens "Lucette" fittings equipped with 150-W lamps are employed; and in the works "Benjamin R.L.M." fittings equipped with similar

Fig. 15.—The "Wellman Smith" Furnace Charger.

lamps are used. There are over 1,500 lighting fittings installed throughout the factory. A " works " office is equipped with " Lucette " daylight-type fittings, with the top portions of the glassware blue. The result is very pleasing and restful. A similar scheme is in vogue in the works laboratory, where Siemens " daylight " industrial-type fittings are used. Perhaps the most interesting feature of the lighting installation is the facilities which obtain for altering the positions of the lamps or making additions. This is effected by the provision of a network of ceiling points throughout the premises, the ceiling roses being spaced at about 8 ft. in any direction. A skeleton system of emergency lighting is served by a standard 45-h.p. A.E.C. automobile engine coupled to a " Newton " dynamo, fig. 8. Arrangements are at present being made for a bank of batteries to be put in circuit automatically in the event of failure. Watertight outdoor fittings on cast-iron posts are employed for the yard lighting, and are controlled by Venner time switches.

Among a variety of miscellaneous equipment of interest to the electrical engineer which may be seen at the works is a line of heat-treating furnaces with automatic remote electrical temperature recording for the information of the metallurgist. Each furnace is fitted with its own thermo-couple which, through a multiple-type switch, is connected to a distance Cambridge recorder. In the laboratory is a " Morgan Crucible " hot-plate, while another item of interest is a metallurgist's " Reichert " microscope, which is arc-lamp illuminated and used for examining metal structures. In the nickel-plating room may be seen a small " Cannon " plating set, which has an output of 100 A at 6 V.

A 130-line Siemens automatic telephone exchange which is doing good work for the internal communications was moved from the Walthamstow works when the company moved some three years ago.

In conclusion, we are indebted to the Associated Equipment Co., Ltd., for permission to view the factory and for the illustrations accompanying this article, and to Mr. A. J. Burfitt, the company's electrical engineer, for his assistance in the preparation of the above notes.

Electricity for the Home.

Some Points Regarding the Construction and Maintenance of Electric Kettles.

By A CONSUMERS' ENGINEER.

NEXT to irons, kettles are probably the most popular of domestic electrical appliances; they would be still more so if, in the first place, they were lower in price, and, in the second, were free from maintenance costs. Much has been done in the last two or three years in the latter direction, and there are now many kettles which are not unreasonably dear to buy, and which show signs of having negligible maintenance.

The essentials of a kettle are:—First, speed; second, reliability; third, light weight combined with robustness; and fourth, good appearance. They can be divided into two classes: (*a*) those with immersed elements, and (*b*) those with external clamped elements.

Speed is best obtained with immersion-type elements, but until recently such elements have not been very reliable. They can be roughly put in two categories, the ring type and the flat or disk type. The former is more widely used, because it is possible to get into the kettle a greater heating area than with the latter, and consequently a bigger safe loading. The latter is very useful for conversion jobs, when it is required to adapt, say, a " Queen Anne " silver kettle to electric heating. The connection box for this type of heater can be housed under the skirting of the kettle, and a very neat job results, whereas with the ring-type elements the side of the kettle would in all probability have to be drilled, and, on a kettle which has not got a flat side, the fixing of terminals or a connection box cannot be neatly done.

The cheapest form of immersion element is that of the mica-sandwich type, placed in a flattened copper or brass tube. If properly rolled, so that it is free from air pockets, it can have a long life, even where the density in watts per square inch is high. If not properly rolled, however, its life is a very short one. Recently elements have become available in which the actual resistance heater is embedded in refractory or other material, which also acts as an insulator electrically, forming a homogeneous whole in a metal casing; this eliminates the necessity for rolling, and is practically indestructible. Elements having a refractory filling medium have limitations, but those using other material which permits of bending to any desired shape offer possibilities of a really good construction, for they can be made to lie closer to the bottom of the kettle than can a ring-type rolled element.

Tubular elements similar in construction to those used for water-heating installations are not suitable for kettles, as they are too heavy. If made up in ring shape, there is difficulty in replacing the heating spiral, and the insulating media also, particularly if the heater has burned out and in so doing has scarred or blistered the inner surface of the surrounding metal sheath, as it is almost sure to do.

The only real drawback to most of the present ring-type immersion heaters is that a quantity of water larger than is actually needed has to be boiled, so as to keep the element covered. This difficulty, however, is overcome by the use of the embedded type. From a maintenance point of view, kettles of this nature are cheaper than those with external heaters, for, although the element itself may be more expensive than would be one or two sections of the mica-sandwich type, the time occupied in effecting a replacement is very much reduced, and it is the cost of labour rather than of material which has to be watched.

Probably the majority of kettles in use at the present time have clamped elements, but they are being gradually superseded by immersion types with which the future lies, except perhaps in areas where the water is very hard. Even there, if a suitable type of immerser is chosen the troubles which are likely to arise need not be greater than with kettles having clamped elements, for unless the latter are very well designed and of heavy construction, and therefore costly, they will be far from trouble-free in such a district. Many attempts have been made to overcome the troubles due to furring and the deposit of limes from such waters, but the writer has yet to find something which will really fill the bill, though he has tried almost all the devices and specifics put forward from time to time. After all is said and done the solution of the trouble is one which is dependent to a very large extent on the user of the kettle. As these notes are written chiefly from the point of view of one who has to maintain hired apparatus, the foregoing remark does not apply so much to owners of apparatus as to hirers. The fact that hired appliances do not receive such careful treatment as owned ones is responsible for many things getting bad names, which in themselves are quite good articles; this should

be kept very much in mind when selecting the types of apparatus which it is proposed to hire out.

In kettles with clamped elements the chief points to bear in mind are that the loading per square inch of element surface must be as low as possible, the actual element surface as large as possible, and that adequate clamping studs must be provided at the right points. The methods of clamping are the weakest points about many otherwise good kettles. The studs should be so placed that they exert pressure along both edges of the element and also right up to its end. Much of the cost of maintaining this class of kettle is due to the fact that the clamping plates do not come right up to the end of the element, thus permitting the two or three end turns to make poor contact with the kettle bottom, resulting in overheating of those turns and their eventual burning out. This defect is also noticeable in similar articles, such as urns, boiling pans, and washboilers. The method of fixing the studs must also be noticed. Soft soldering is not good enough, particularly when the studs are fixed to the underside of the bottom and are not put through from the inside. Above all the kettle bottom must be flat and such as will stay flat. All studs and connections should have lock nuts, and copper connecting wires should be viewed with caution. Nickel wires or strips are better.

As compared with the immersion-element type, the clamped-element type of kettle is too heavy, though from the point of view of mechanical strength it probably scores, but at an increased manufacturing cost. It is essential that the body should be of fairly heavy gauge, so as to carry a bottom which will be stout enough to resist the buckling tendencies which are inherent in this method of heating, and a light-weight kettle of this description is necessarily a weak one.

Summarising, the immersion kettle has the advantage with regard to speed, but there is not much to choose with regard to reliability. It is also of less weight, and often of better appearance. With regard to cost, there is not much to choose between the two types, when made of the same material and of similar body shape. Immersion kettles can, however, be made in designs which are cheaper to produce than is the body of a kettle which has to carry clamped elements. On the whole, therefore, the immersion kettle presents the greatest number of advantages, the most important of which are speed and easy maintenance. It might be thought that ease of maintenance would be offset by an increase in the number of maintenance calls, but this is not found to be the case in practice, though it might be so if proper care were not exercised in choosing the kettle. This leads us to consider whether or not it is desirable to use a protected kettle, and if so, what form the protection should take.

There can be no doubt that a properly protected kettle will reduce both maintenance costs and possible causes of annoyance to the user. The actual cost of maintenance seems to vary greatly in different parts of the country, even in places where the same type of kettle is in use. Whether or not it will pay any undertaking to use protected kettles must, therefore, depend on the maintenance costs of unprotected ones and the increased price which it would have to pay for protection. In the writer's own undertaking it makes little or no difference to overall costs, and the consumer is free to choose either one or the other. The writer is personally of the opinion that an unprotected kettle is quite a sound proposition, as the public has become educated to the use of kettles and the number of burn-outs is very small. If, however, he were starting afresh in virgin territory, he would in all probability use a protected type.

Assuming that a decision has been made to use a protected kettle, care must be taken to see that the introduction of protection against one sort of fault does not introduce others. The methods of protection can be classed as :—

(1) The use of a fusible plug to interrupt the circuit within the body of the kettle. (2) A similar plug to interrupt externally by throwing off the connector. (3) The use of the movement of the kettle bottom under the influence of heat to act as in (1) or (2). (4) The use of a bi-metallic strip, housed in the kettle bottom, to act as in (1). (5) A similar strip to act as in (2).

The advantages and disadvantages of the various methods are as follows :—

Class (1) has the drawback that after operation it is necessary to send out a service man to open out the kettle and effect a replacement before the kettle can be put in commission again. There is, therefore, no saving in annoyance to the consumer and but little saving in labour to the undertaking.

The actual interruption of the circuit is dependent on a spring which, when called on to act, has probably lost its temper. There is, when the spring operates, a risk of loose parts coming in contact with live parts, thus making the kettle body alive. There is always the possibility of some mechanical weakness in the fusible part causing it to operate unnecessarily.

A variation of this form is that in which a milled sleeve is soft-soldered on to a stud or pillar attached to the kettle bottom; the sleeve holds back a catch against the pull of a spring, by means of a pawl which engages with the slots or ribs of the sleeve. The pillar carrying the sleeve is liable to be thrown out of the normal by distortion of the kettle bottom, thus either causing the pawl to slip before it ought to, or, on the other hand, causing the sleeve to bind when it should be free to turn.

Class (2) has all the objections of the first, except that of needing a service man to effect a replacement. It has further disadvantages in that a connector with live sockets is thrown off and may be left lying about within reach of children, and in operation it may damage crockery on a table; if it has been used in a house where it is not customary at times to remove the connector from the kettle, it will have become more or less tight on its terminal pins and will refuse to leave them under the pressure of the spring.

Class (3) is bad because to get the desired movement the kettle bottom has to be dished, resulting in relative movement between the kettle bottom and the elements, which does not improve the life of the latter. Again, distortion of the bottom under normal conditions of use may be sufficient to cause it to function prematurely, or distortion in the other direction may prevent its functioning when it should.

Class (4) is good in principle and is being tried by several makers. One very ingenious pattern is completely automatic, both breaking the circuit and also remaking it when the kettle cools down. The latter is going a bit farther than is necessary or desirable. If it stopped at the automatic break and provided some external means for reclosing, it would approach the ideal. There was such a kettle some years ago, but it had too low a loading to be useful, and the writer has not seen or heard of it for some time.

Class (5) is also good in principle, but it has the disadvantage, as compared with (4), that the connector is thrown off as in (2).

In the foregoing summary the principle only has been considered, and no consideration has been given to the cost of applying it. It will have been noticed that class (4) is the one most favoured, but when cognisance is taken of cost, then the author favours class (1) as being the best on points all round at present. Until class (4) is obtainable at a competitive cost, he is not, however, keen on protection at all.

In conclusion, a few remarks might be made as to the metals from which kettles are made. Copper offers the best life so far as the body is concerned; nickel-plated copper has the best appearance; and aluminium is lightest and, except in districts where the water is alkaline, offers a good body life. An aluminium kettle can also be more easily buffed up than can a copper body, but if mechanically damaged it cannot be repaired as can the latter. It does not offer any possibilities at all as a suitable metal for a clamped-element kettle, but it serves excellently for immersion-type appliances.

Any kettles made of copper, or containing immersers made of that metal or of brass, should, of course, have heavily-tinned interiors.

"Tranfuse" Overload Protection.

A comparison of a new system employing fuses, patents applied for, with other methods of overload protection more generally known.

By R. W. BILES, A.M.I.E.E.

OVERLOAD protection is employed for two main purposes: first, to safeguard feeders or apparatus from sustained overloads due, possibly, to abnormal running conditions; secondly, to protect feeders or apparatus against excessive loads due to fault or short circuits on the network. In the latter case it is often provided as a "second line of defence" to act in case of the failure of the discriminating pilot-wire protective gear which may be connected to the feeder or apparatus, but its function is also to protect the busbars which are not usually protected by any other means.

The oldest and probably the most well-known circuit for this purpose is illustrated in fig. 1, which shows the secondary connections of current transformers and relays shunted by suitable fuses. This method has given excellent results in practice for a number of years, and is still used in many cases in which its characteristics are suitable for the conditions in the network. Simplicity and ease of maintenance are the chief points in its favour, and the type of relay used is of the ordinary electromagnetic attracted-armature pattern of robust design. The system, however, has certain drawbacks, especially when applied to an extensively interconnected network; its main fault is the inability to provide discriminative time settings. The reason for this will be apparent by examining fig. 2, which shows the time-current characteristics of various fuses of different ratings. The time difference between fuses is negligible at the larger currents, and, in consequence, this form of protection is not sufficient when graded time intervals are required to meet all conditions of overload.

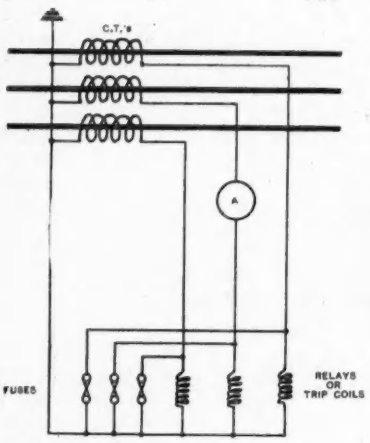


Fig. 1.

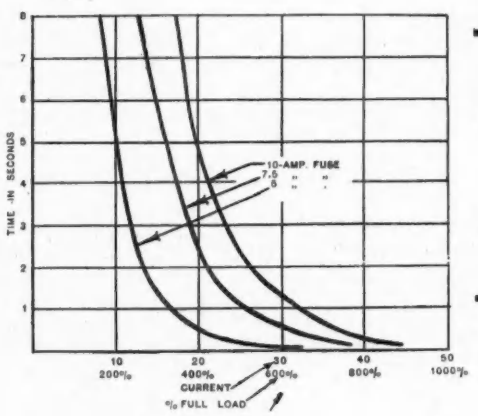


Fig. 2.

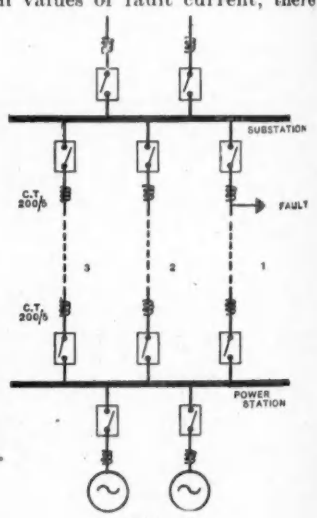


Fig. 3.

In comparing the different forms of overload devices to be referred to later, it will be advantageous to compare them when applied to the common network illustrated in fig. 3, representing a power station and sub-station interconnected by three parallel feeders. The fault is assumed to be on feeder 1, near the sub-station end, and the current flowing into the fault will, therefore, be almost equally shared by the feeders 1, 2, and 3, the currents in feeders 2 and 3 being approximately half that in feeder 1 at the sub-station end. Considering a short-circuit current of 2,000 A and the application of the system illustrated in fig. 1, all fuses would blow concurrently, and the supply to the sub-station would be interrupted; further, the value of Merz-Price or any form of pilot-wire protective gear connected to the feeder would be entirely wasted by the operation of the feeders on overload.

It is evident, therefore, that a time lag is required on the overload protection, first, to ensure that the pilot-wire gear, if any, will operate first, and, secondly, to discriminate between sound and faulty feeders in the absence or failure of pilot-wire gear. The first condition can be met by installing a definite time relay of the pendulum or clockwork pattern, which will also give a time grading between the power station and sub-station to guard against busbar faults. This method will not fulfil the second condition, as it will be impossible to set the times at the sub-station end for discrimination with faults on any one of the feeders.

The use of an inverse definite-time a.c. relay will improve matters, providing the time-current characteristic is such that, at all values of fault current, there would be ample time-grading between the devices in the feeders. Such a characteristic, however, is not attained by many well-known relays at present in use, the curves of which flatten out at 400 per cent. to 500 per cent. full load. The desirable characteristic is a straight line proportionate decrement in time for an increment in current throughout the whole range of its characteristic. One may approach this condition, however, by means of the circuit illustrated in fig. 4, which consists of the addition to the arrangement shown in fig. 1 of three small iron circuits (functioning mainly as choke coils) and three small resistances. The choke coils are, in reality, variable impedances, the variation depending upon the voltage applied to the terminals of the coils. They form parallel circuits to the fuses which, during overload conditions, have a limited current passing through them and, therefore, give a definite time lag. The time-current characteristic is the combination of the normal fuse characteristic as in fig. 2 with the current saturation characteristic of the choke coils. The impedance of the coils is also variable by tappings, by which means various time characteristics can be obtained. The true ratio of the main current transformers is maintained up to twice full load, which enables the standard practice of metering in the secondary circuit to be retained.

The characteristics are illustrated in fig. 5, and it can be seen from the slope of the curve that correct discrimination would be obtained for the conditions described for fig. 3. An examination of the bottom curve, which is the worst case, will show that a time grading of 0.6 second between 500 and 1,000 per cent. full load is possible, which is the minimum for good practical service. A similar result can be obtained by using auto-transformers or small intermediate auxiliary transformers in the secondary system, or by loading up the circuit by means of resistances in series with the pilot wire.

The apparatus shown diagrammatically in fig. 4 is of comparatively small dimensions, contained in a case which can be mounted at the back of the control panel, and, furthermore, it is apparatus which can readily be applied to any existing overload protective system employing the standard sizes of current transformers. These desirable inverse-time characteristics can also be obtained with the supersensitive direct-acting trip coil arrangement when the current transformers are connected directly to the fuse-shunted trip coils of the switch. A large saving is thus effected by the elimination of a relay and an auxiliary d.c. trip battery. Incidentally, there seems to be no reason why sub-stations should not be equipped with Merz-Price or some form of discriminating pilot-wire equipment to be operated directly from series current transformers, and the adaptation of the "tranfuse" method will simplify the arrangements and maintenance for this purpose. The question of the maintenance of the current-time characteristics is met by the periodical changing of the fuses, the frequency depending upon the current which the fuse has been called upon to carry during its period of service. The renewal of fuses is usual after from 6 to 12 months' service.

It is worth noting that with the "tranfuse" method the fuses carry less current during overload surges than in the original method of fig. 1, and consequently will not deteriorate so quickly.

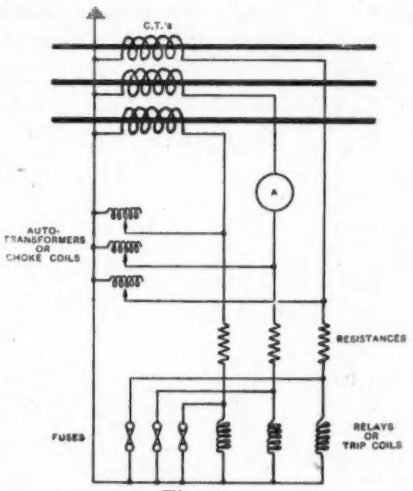


Fig. 4.

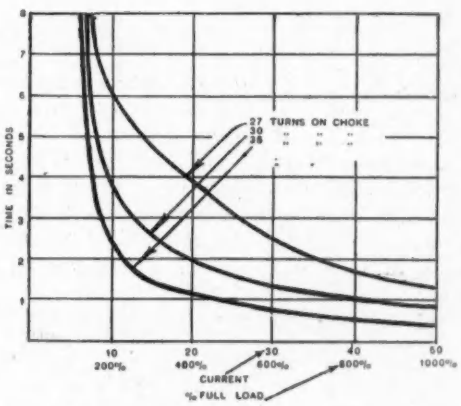


Fig. 5.

The Sales Engineer's Task.

The necessity for technical and commercial ability, combined with a knowledge of propaganda methods.

By S. G. BURDICK.

THE sales engineer of a supply undertaking has to be a man of parts. Salesman, buyer, engineer, and organiser, he must be able to handle complaints intelligently, exercise judgment in the engagement and treatment of his staff, and show tact and discrimination in his dealings with consumers. A successful sales engineer must also be versed in the many branches of propaganda. The vital importance of this will be readily admitted when it is remembered that publicity, in one form or another, is generally the first point of contact with a potential consumer and, equally often, forms the initial basis for the recipient's opinion of, and subsequent attitude to, the supply undertaking.

Bearing in mind that the sales engineer's primary concern should be to establish the most cordial relationships possible between his department and the public, it follows that the first letters sent by the undertaking to a new consumer should be composed with that end in view. Unfortunately, this generally does not obtain. The impressions of a householder, after applying for supply and receiving the normal stereotyped letter, together with an application form bristling with conditions, threats, and penalties, cannot be conducive to goodwill. The remedy would appear to lie, generally, in the fuller grasping by the supply industry of the obvious fact that its business growth depends as much on the sale of electricity as on its generation, and, particularly, in the giving of a greater freedom and a wider scope on the sales side.

To meet the example cited, it should be a matter of ordinary routine for the sales staff to edit the circulars and form-letters of the other departments. Utopian conditions are not found normally, however, in inter-departmental working, and it may be necessary to seek other means to gain the new consumer's interest. It is not possible to lay down hard and fast rules as to the methods to adopt, but many avenues of approach are open. In one case the following letter, sent on the day the installation is connected, has proved valuable :—

"Dear Sir,—I am going to dispense with the formality usually adopted by public supply undertakings to welcome you personally as a new consumer and to assure you of my close interest. The primary object of my Department is to be of real service to you in all matters electrical; should you at any time require information or any assistance that my company can give, please let me know. We appreciate every opportunity given us to help you and we are definitely at your service."

This letter is accompanied by the E.D.A. booklet "The House You Want" overprinted with the undertaking's name and address on the front and a synopsis of the services offered—*i.e.*, hire-purchase details, &c.—and the sales department's slogan "We *can* help you—*may* we?" on the back. An alternative enclosure is a booklet of the same size dealing with the company's activities, tariffs and special offers—*e.g.*, the supply of irons for a week's trial—written on the theme of "Service."

The Electrical Development Association has done, and is doing, a tremendous amount of spadework and the publicity matter issued has proved effective. The writer has had no little experience of the work of, and the results gained by, this body and can testify to the excellence of both. It, however, should be emphasised that even the E.D.A. cannot be expected to cope with every individual situation requiring propaganda. Accordingly, the onus of the all-important personal letter is borne by the sales engineer. If he is adept at the composition of interest-compelling matter, well and good, but it often happens that he is a good salesman and a good engineer and no more, and has to attempt something beyond his reach or lose a valuable opportunity. As poor publicity is nearly as bad as none at all, it is suggested that the E.D.A. might help by giving the framework of a series of letters or inviting the submission of letters under given headings which have proved useful and distributing these.

Apart from the sales department's activities, the next point of contact which the undertaking makes with the consumer is the meter reading. The meter reader is invaluable as a potential salesman for it is to him, as a representative, that the housewife turns.

An instance of the value of these "casual salesmen" was afforded some years ago in a provincial station. The consumers' engineer was paid commission on the sales turnover and offered half of his commission to the meter readers on the sale of the smaller domestic appliances. So successful was the query "But surely you've got an iron, Madam?" that the commission rate was revised!

The wiring and repair staffs, also, should be encouraged in sales work and the spreading of propaganda. Material encouragement, in the form of commission or prizes, acts as an incentive and a sales graph displayed in the workshop maintains interest. A note of warning should be sounded here against excessive zeal on the wireman's part. It is important that consumers should not be importuned and any tendency to this should be promptly arrested. An atmosphere of friendly interest is difficult to promote and, when attained, should be carefully guarded.

It must be confessed that the general attitude of the supply industry to the consumer is disappointing. The small tradesman and the large multiple store alike build up their goodwill laboriously—are we too lethargic or too dignified to go all out for the public interest?

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The London Chamber of Commerce.

We have received from the London Chamber of Commerce a copy of its report for the year 1929. It is a bulky production but covers only briefly the multitudinous activities of the Chamber. In the section devoted to the work of the Electrical and Allied Trades Section, of which Mr. P. M. Rossdale is chairman and Mr. A. M. Sillar deputy-chairman, it is stated that further consideration was given to the suggestion that the Section should be reorganised to represent the electrical manufacturing industry more effectively. The list of members was examined, and it was found to comprise electrical interests of a miscellaneous character, including agents, trade associations, cable companies, engineers, electrical manufacturers, merchants and importers, supply companies and telephone services, and fulfilled a useful function in dealing with questions of a general character and of common interest, such as legislative measures. It was not considered necessary in these circumstances to pursue the proposal further, and for the time being the machinery of the Section, as at present existing, is preserved intact, meetings being convened as and when necessary to deal with problems within the province of its membership. It was thought, however, that an attempt should be made to enlarge the scope of the Section, with a due regard to the existence of many active associations relating to each specialised branch of the industry.

During the year the Household Appliances Section had under consideration the organisation of a periodical Electrical, Ironmongery and Household Appliances Exhibition. A conference of representatives of the hardware and ironmongery trades and of the British Electrical Development Association was held. A communication was received from the British Electrical and Allied Manufacturers' Association to the effect that, so far as its members were concerned, the series of exhibitions already in existence—which were in fact a considerable tax on manufacturers' resources—seemed adequately to cover the necessary ground and it could not give support to any further trade exhibition. At a later conference, the Ironmongers' Federated Associations seemed reluctant to add to their exhibition commitments beyond the British Industries Fair. Their Council promised, however, to give the matter further consideration if a fair number of manufacturing groups promised support and if the question of direct sales at such an exhibition was first settled. As it did not appear that sufficient support for the project would be forthcoming from manufacturers, it has been abandoned for the time being.

A Dundee Cable Contract.

At a recent meeting the Dundee Electricity Committee had before it tenders for the supply of cable. The lowest British tender was £3,301 against a foreign offer at £2,931. The Convener of the Committee said that the foreign cables were satisfactory, and he was afraid that they would be compelled to accept the tender. The Lord Provost considered that the difference between the British and foreign prices was not excessive having regard to the conditions obtaining. They could not expect this country to be prosperous unless such questions as this were given fair consideration. The Committee decided to recommend the acceptance of the British tender.

A Spanish Electrical Combine.

A financial group, including two or three banks, has founded a company called the Compañia de Luz y Fuerza de Levante with a capital of 30,000,000 pesetas, which the various hydro-electric companies of the east of Spain have joined. The aim of the company is to develop the consumption of electricity, which will involve extending the existing plants.—*Reuter's Trade Service* (Madrid).

A New Philips Company.

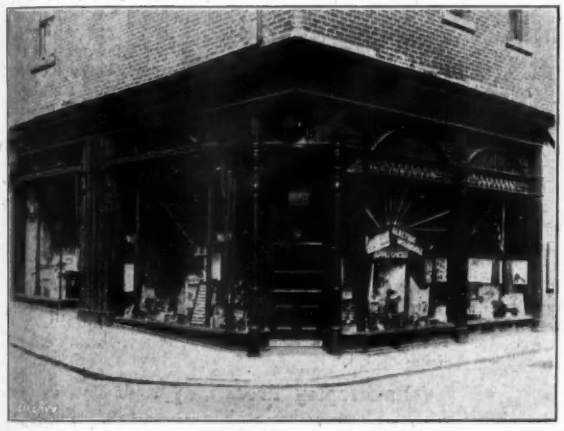
The Philips Elektro-medicin, G.m.b.H., has been registered in Berlin with a capital of 200,000 marks to manufacture and sell electro-medical apparatus according to the processes of the Philips Glow Lamp Co., of Eindhoven, Holland.

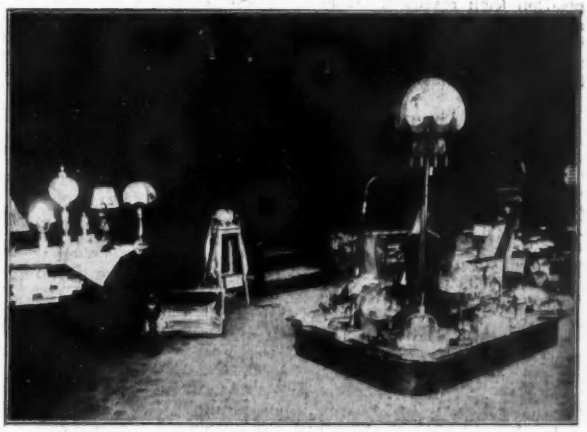
Commercial Education.

At the International Congress on Commercial Education in Amsterdam last September, the British delegates unanimously decided in favour of the formation of a British Association of Commercial Education. Such an association is now in being, and it will shortly hold its first general meeting; Mr. F. W. Goodenough, C.B.E., is chairman of the provisional committee, and Mr. N. Skene Smith, London School of Economics, Houghton Street, W.C.2, is hon. secretary. The objects of the organisation are to advance commercial education in Great Britain and Ireland and the British Empire through co-operation between employers, employés, teachers, educational administrators, and authorities; the encouragement of definite educational work by commercial undertakings; the investigation and discussion of problems related to the aims of the Association; the holding of periodical conferences, and participation in national and international congresses; the printing and circulation of papers and reports; and co-operation with similar organisations.

New Municipal Showrooms.

The new electrical showrooms of the Morecambe and Heysham Corporation were formally inaugurated by the Mayor on April 11th. The showrooms occupy a commanding site on Queen Square at the corner of New Queen Street and Lines Street, and are easily accessible from all parts of the town. The conversion has been carried out entirely by local firms.





Exterior and Interior Views of the Morecambe and Heysham Corporation's Showrooms.

The corner shop has been decorated with an oak-panelled effect, and makes a bright and cheerful general showroom. The adjoining shop has been converted into a domestic showroom, and here the decorative scheme is attractive and unusual, the ceiling and walls being painted sea blue with a frieze of fishes and marine vegetation. In the rear is an office for the showroom attendants, while the first floor is occupied by a large room equipped for the holding of lectures, &c. All the show windows are so arranged that they can either be opened at the back to give a view of the interior or curtained to accommodate set-ups or window displays. Two views of the showrooms are shown in the accompanying illustrations.

Great Britain's Radio Exports.

According to the *Wireless and Gramophone Trader* the total value of radio apparatus exported from this country during February was £91,537, including valves valued at £23,066. The principal market was the Union of South Africa, to which goods worth £12,628 (valves £3,727) were sent. Australia was next in order with a share valued at £10,821 (valves £3,727), and Holland was third with £9,639 (valves £213). France took goods worth £7,811 (valves £4,415); Japan's share was £6,000 (valves £13), that of Belgium £5,212 (valves £1,521), and that of Italy £4,879 (valves £291).

The Change-over at Walton.

At a recent meeting of the Walton-on-Thames Council the electrical engineer (Mr. E. A. Anderson) reported that the change-over from d.c. to a.c. had been made without a hitch on March 21st. It was mentioned that among the claims received on account of apparatus rendered useless by the change-over was one from a firm of electrical engineers, who said that they held certain stocks of d.c. apparatus which the manufacturers refused to take back. The Clerk said that the Council was legally bound to meet such a claim, but there was a limit to its liability. It was decided that the firm should be asked for a definite statement.

A Permanent Italian Electrical Exhibition.

Commerce Reports states that an organisation called Sviluppo Propaganda Elettroapplicazioni e Similari (Propaganda for Developing Electrical and Similar Appliances), more familiarly known as S.P.E.S., has recently opened a permanent exhibition of electrical household appliances in Turin, Italy. This organisation, which is a subsidiary of the Società Idroelettrica Piemonte, one of the largest producers of hydro-electric energy in Italy, has for its principal object the diffusion of knowledge on the application of electricity in the home. Every article which is on exhibition has first been carefully tested in the laboratory of the S.P.E.S. before it is recommended to consumers. The concern makes direct sales from its showrooms in Turin and from its branch in Busto Arsizio, Lombardy.

Electrical Farming Appliances in Australia.

The Victoria (Australia) Electricity Commission is urging farmers to use as many electrical appliances as possible in their farming operations, and has asked suppliers for particulars and prices of certain apparatus. One of the articles specified is an electric hot-water system, and the likelihood of imported heaters being purchased provoked protest by a local manufacturing company. It states that it has been producing such a heater for six years, has over 2,000 in use, and alleges that the makers of imported hot-water systems in every case observed are not even aware of the special rates available for continuous water heaters, nor of the conditions most suitable to the consumers. Quotations had already been invited by the Commission from British firms for the supply of milking equipment, incubators, and other farm plant, but the Prime Minister of Victoria has now announced that he will not sanction the importation by State Departments of any commodity that can be made in Australia, or can be done without. The Commission will therefore have to obtain the Premier's permission before it can place the orders in England.

Wiring Rules and Showrooms at Southend.

The Southend borough electrical engineer has presented to the Electricity Committee suggested rules with regard to the wiring of premises for electric lighting, which he has prepared after consultation with representatives of the Chamber of Trade. Members of the Committee are to be furnished with copies of the rules, and the consideration of the matter has been deferred. The engineer has also been directed to submit to the Committee a report dealing generally with the question of the establishment of a showroom and the acquisition of a site. At a recent meeting of the Town Council a member asked if it was proposed to sell apparatus in competition with local electrical dealers. Councillor Le Masurier said that the Committee had not the least intention of entering into competition with private traders. Whatever it did would be to further the electrical policy of the borough, and it had had conferences with the electrical trade representatives of the Chamber of Trade. Another member asked if the showroom would only be used for exhibition purposes, and wished to be assured that there was no suggestion of the Council's selling apparatus from the showroom. Councillor Le Masurier replied that the Council had the power to sell or hire, and he did not think it fair to give any undertaking not to sell or hire apparatus, and he did not think it advisable to make any forecast. He reiterated that there would not be any conflict or competition with the interests of the local traders. The proposals of the Committee were agreed to.

Large American Radio Amalgamation.

The amalgamation of the American General Electric Co. and the Westinghouse Electric and Manufacturing Co. with the Radio Corporation of America was recently formally announced. Mr. David Sarnoff, president of the Radio Corporation, stated that the amalgamation would unify the rights of manufacture and sale of wireless sets by these companies, which would result in reduced prices for sets and valves. Under existing arrangements, the R.C.A. has the selling rights and the Westinghouse and General Electric Companies the manufacturing rights. Indications that the amalgamation may meet with opposition were seen in a speech made in the Senate by Senator Dill recommending that the Department

of Justice should investigate "this new radio trust" with reference to the Sherman Anti-Trust Law.—*Reuter* (New York).

Electrical Engineering Production.

The *Board of Trade Journal*, in a review of the economic position of the United Kingdom in March, shows that the B.E.A.M.A. index of production for that month was 118.8 (1924=100), as compared with 117.8 in February, and 101.9 in March last year. This indicates a continuance of the steady advance which has been made during the last year or so.

The South African E.D.A.

The draft constitution drawn up by the Organising Committee for the Electrical Development Association of Southern Africa has now been circulated to electricity undertakings throughout South Africa and to all local branches or agents of manufacturers of electrical machinery and apparatus, and to wholesale distributors. The proposals have, as far as can be gauged in the short time which has elapsed since they were distributed, been received with no little enthusiasm. It is generally appreciated that the time is ripe for such an organisation. Some little time must necessarily elapse before definite replies are received from the large number of public bodies and firms who have been communicated with, but it is hoped that the majority will have come to a decision by the first half of May, when the Committee will consider the position then revealed. It is reasonable to expect a response such as will permit the inauguration of a vigorous and effective campaign throughout the country. That decisive results are possible is beyond question, for we are so far only on the fringe of electrical development.—*South African Engineer.*

Unemployment Relief Works.

The April *Ministry of Labour Gazette* gave particulars of the expenditure up to date under the various schemes which have been instituted by the Government for the alleviation of unemployment. It was shown that under the Development (Loan Guarantees and Loans) Act, 1929, grants totalling £10,561,264 had been made in respect of electricity schemes, calculated to give employment to 44,000 people. The total includes £9,000,000 which is to be devoted to the standardisation of frequency in North-East England, the largest "non-standard" area in terms of existing plant and equipment.

The *Gazette* also mentioned that the Post Office has commenced certain works on trunk telephone construction, involving an expenditure of £750,000, which would normally have been begun next year; and other works, involving a further £750,000, which would not normally have been put in hand until 1931-32 are being accelerated. These are additions to the main construction programme, for which during the current year capital amounting to £10,500,000 has been provided.

American Electrical Wholesalers.

We have received from Mr. W. J. McLaughlin, the editor of the *Jobber's Salesman*, Chicago, a copy of the tenth anniversary number of that monthly magazine.

This is of considerable interest as showing the organisation of the electrical wholesaling business in the United States. The main organisation is known as the National Electrical Wholesalers' Association; it was founded in 1898 as the Electrical Supply Dealers' Association. The Association has six divisions dealing, respectively, with wiring supplies, outdoor construction materials, power apparatus, lamps and lighting, merchandising, and radio. Each division has three committees which deal with trade relations, market study and "better selling." It is shown that in 1920 electrical wholesalers, or "jobbers" as they are termed in the United States, had four outlets for their supplies: the contractors, the contractor-dealers, the industrial plants, and the central stations. These four remain the principal customers of the jobbers, but in addition there are now radio retailers, hardware stores, "chain" stores, furniture stores, drug stores, department stores, and general stores. In the last decade the number of jobbers has increased from 425 to 965. Our contemporary reproduces a chart showing the growth of appliance sales between 1922 and 1928. The principal line and the one which has made the greatest progress is radio apparatus and valves ("tubes"), the sales of which totalled about $119 millions in 1928. Heating appliance sales rose from about $27 millions in 1922 to $76 millions in 1928. As an indication of the fall in the prices of some lines, it may be noted that the value of sales of incandescent lamps declined from $69 millions in 1922 to $52 millions in 1928 although there was a large increase in the volume of sales. A similar movement occurred in the sales of wiring devices.

A Tribute to British Salesmanship.

At a time when there is so much adverse comment upon British salesmanship in foreign markets it is refreshing to receive testimony to the opposite effect from an American source. In an article on the market for electric lighting plants in Greek Macedonia and Thrace, a writer in *Commerce Reports* says that the principal countries of origin of the electric lighting plant sold in this territory are Great Britain (65 per cent.) and Germany (20 per cent.). He goes on to attribute this state of affairs to the fact that "British and German manufacturers have been represented in the market for some time past by dealers who have shown a certain amount of aggressiveness in introducing their plants. The granting of liberal credit terms to purchasers has also stimulated sales."

London Electricians' Claims.

The *Daily Worker* reports a meeting on April 24th between the Disputes Committee of the London District of the Electrical Trades Union and representatives of London electrical employers. The Committee put forward claims for the stabilisation of the existing rate (1s. 11d. per hour) for twelve months; six days' holiday with pay per annum; and payment for all statutory holidays. The claims for paid holidays were rejected by the employers, who offered to stabilise wages at 1s. 10½d. per hour. They also stated that if their offer was refused they would consider the cessation of payment of the extra 5 per cent. granted last year and the enforcement of the "cost-of-living" reduction of 1½d. an hour which will become due in June.

The E.T.U. section of the "Minority Movement" recommends the rejection of the employers' offer and the pressing of the following demands: A guaranteed wage of 2s. per hour; the abolition of the sliding scale agreement; and the granting of six days' holiday with pay and payment for all statutory holidays.

Local Exhibition.

The Heston and Isleworth Urban District Council Electricity Department (engineer and manager: Mr. E. W. James) organised an exhibition of electrical appliances for the home at the Public Hall, Isleworth, this week in connection with its recently established showroom. The show was opened on April 28th by the chairman of the Council, who was supported by other councillors, the undermentioned firms being amongst the exhibitors:—Lissen, Ltd.; Kelvinator, Ltd.; General Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Berry's Electric (1928), Ltd.; British Electric Transformer Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Sadia, Ltd.; British Vacuum Cleaner and Engineering Co., Ltd.; and Hoover, Ltd. Lighting fittings of numerous kinds and several makes were also displayed.

The Annual "Exide" Convention.

This year's convention of "Exide" battery-service agents organised by the CHLORIDE ELECTRICAL STORAGE CO., LTD., is to be held in Edinburgh towards the end of this month. As usual, the proceedings will close with a banquet, to be held at the North British Hotel.

Bankruptcy Proceedings.

B. L. COX, electrical engineer, Holmes Yard, Shirland Street, Chesterfield.—Receiving order made April 17th on debtor's own petition. First meeting, May 2nd, at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham. Public examination, May 16th, at the County Court, Chesterfield.

B. MARSH, electrician, 6, Victoria Road, Brighton.—Last day for proofs for dividend, May 9th. Trustee, Mr. A. Orbell, 6 and 7, Old Steine, Brighton.

Company Liquidations.

IMPERIAL TRAMWAYS CO., LTD.—It is announced that the assets of the company have been realised and steps are being taken to wind up the company voluntarily and distribute the assets. A meeting is to be held on May 12th when a resolution for voluntary liquidation, with Sir William McLintock as liquidator, will be submitted. It is stated that after the repayment of the share capital there will be a substantial surplus.

ELECTRICAL NAME & NUMERICAL SIGN CO., LTD.—Winding up voluntarily. Liquidator, Mr. E. G. F. Cartwright, 4, Heathcote Street, W.C.1. Particulars of claims to the liquidator by May 31st.

BRITISH UNIVERSAL ILLUMINATIONS, LTD.—A meeting of creditors is to be held at 11, Warrior Square, St. Leonards-on-Sea, on May 5th, and a resolution for winding up is to be proposed at a meeting of shareholders which has been called for the same day.

BATTERY SUPPLIES, LTD.—A meeting of creditors is called for May 3rd at 4, King Street, Hammersmith, W.6.

New Catalogues and Lists.

ENFIELD CABLE WORKS, LTD., 296/302, High Holborn, W.C.1.—A net price list and data of "Enfield" cables.

DRAYTON REGULATOR & INSTRUMENT CO., LTD., West Drayton, Middlesex.—Two illustrated leaflets dealing, respectively, with heavy duty industrial steam traps and differential steam traps.

Messrs. FALK, STADELMANN & CO., LTD., 83 to 93, Farringdon Road, E.C.1.—An illustrated price list of white enamelled electrical fittings for the bathroom.

Messrs. WILLIAM GEIPEL, LTD.—An illustrated and descriptive leaflet on "Vitrohm" sound control equipment, for which the company is the sole selling agent in this country.

VENNER TIME SWITCHES, LTD.—List No. X100 dealing with the company's stop watches, in which many new types are described. Illustrated.

Messrs. M. W. WOODS, LTD., 46, Kingsway, W.C.2.—An

illustrated catalogue containing particulars and prices of "Windifans."

EDISWAN SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—A folder, illustrating and describing X-ray reflectors for shop-window lighting.

SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, W.C.2.—Three illustrated folders dealing, respectively, with the "Wylex" switch plug, "Premier," "Goblin," and "Vac-Tric" vacuum cleaners, and the "Sunco" ceiling rose with patent terminal block. Priced.

IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, E.C.4.—Publication No. 6651, advertising the Igranic transverse current microphone and microphone control unit.

STURTEVANT ENGINEERING CO., LTD., 147, Queen Victoria Street, E.C.4.—A well-produced and illustrated brochure (publication No. 1124) dealing chiefly with the company's combined Plenum system of heating and ventilating.

Messrs. A. P. LUNDBERG & SONS, 477 to 489, Liverpool Road, Holloway, N.7.—Leaflets Nos. E1. 88, 89 and 90 dealing, respectively, with plug connectors for radio circuits, "all-bakelite" twin and triple-socket plugs, and q.m.b. push-button switches. Illustrated and priced.

Messrs. S. G. BROWN, LTD., North Acton, W.3.—The April issue of the "Brown Budget" contains, in addition to articles on the company's activities, useful hints to the radio dealer on the increasing of sales.

RELAY AUTOMATIC TELEPHONE CO., Marconi House, Strand, W.C.2.—A booklet drawing attention to the company's products, with a list of some contracts recently carried out.

CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—List No. 162 describing the company's a.c. instruments for high frequencies. Illustrated. Also a supplement to the list dealing with the uses of the apparatus described.

Messrs. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1.—A blotter drawing attention to the company's malleable iron clamps for electrically bonding armoured cables.

Messrs. CROMPTON PARKINSON, LTD., Guiseley, Leeds.—An illustrated brochure describing the company's marine d.c. dynamos and motors.

Messrs. HERBERT MORRIS, LTD., Loughborough.—Book No. 449 illustrating the many applications of Morris conveyors.

ENGLISH ELECTRIC CO., LTD,. Queen's House, Kingsway, W.C.2.—Publication No. K80 containing illustrated particulars of the company's rotary convertors.

Catalogues Wanted.

The CAMBRIDGE ELECTRIC SUPPLY CO., LTD., is opening offices and showrooms at 4, Market Hill, Cambridge, and is anxious to receive manufacturers' lists of fittings, accessories, novelties, and heating and cooking apparatus.

Trade Announcements.

The WHITE ELECTRICAL INSTRUMENT CO., LTD., recently removed to a new factory at 90 and 92, Rosoman Street, Rosebery Avenue, E.C.1.

Mr. J. PENDREICH, 73, Saughtonhall Drive, Murrayfield, Edinburgh, has been appointed sole agent for Scotland for Messrs. Phillips & Turner, Cambridge Street, Birmingham.

The telephone number of the Maidstone branch of SUPER-LAMP, LTD., has been changed to Maidstone 3033.

The WHOLESALE BATTERY CO., electrical and radio engineers, of Luton, have removed their business to larger premises with modern showrooms in Manchester Square.

Owing to expansion of business, CRYSELCO, LTD., has removed its Leeds branch to 43, York Place, Leeds. (Telephone: Leeds 27866.)

Messrs. FALK, STADELMANN & CO., LTD., have opened well-equipped and up-to-date showrooms at 15, 17, and 19, New Station Street, Leeds. (Telephone: Leeds 29741; telegrams: "Trilux, Leeds.")

From May 8th, the London office and showroom of Messrs. WM. SANDERS & CO., will be at 78, Neal Street, W.C.2. (Telephone: Temple Bar 8984.)

The business of Messrs. Tinker, Shenton & Co., Ltd., has been purchased by Messrs. JOSEPH ADAMSON & CO., Hyde, Cheshire.

Social Event.

The fourth annual dinner and dance of the Social and Athletic Association of Messrs. Evershed & Vignoles, Ltd., was held on April 4th at Chiswick Town Hall under the chairmanship of Mr. Vines, president of the association. Over 230 members and friends were present, a record attendance.

Book Notices.

"Willing's Press Guide, 1930."—The new issue of this useful publication contains all the main features as heretofore, namely, an alphabetical list of newspapers and periodicals published in Great Britain, Northern Ireland, and the Irish Free State, brought up to date; in addition long lists of Dominion, Colonial and foreign papers have been added. The guide is published by Willing Service, of 356-364, Gray's Inn Road, W.C. Price 2s. 6d.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIX. April, 1930. New York: The Institute. $1.

"*Journal* of the Institution of Engineers, Australia." Vol. II., No. 3. March, 1930. Sydney: The Institution. Price 7s. 6d.

"Science Abstracts" (A. & B.), Vol. XXXIII. March, 1930. No. 387. London: E. & F. N. Spon, Ltd. Price 3s. 6d. each.

Wages in the Cable-making Industry.

The Joint Industrial Council for the Electrical Cable-making Industry has sent us a new schedule of wages payable in the industry on and from the third pay-day in May, rendered necessary by a fall in the cost-of-living index. The new rates, based on a 47-hour week for time workers, represent reductions of from 1s. 6d. to 2s. per week for male workers of 21 years of age and over; from 6d. to 1s. 6d. in the case of youths and boys (under 21); and from 6d. to 1s. for female workers.

New French Company.

A company has been formed in Paris with a capital of £1,200,000 and the title La Société La Juralpes to finance the establishment of new hydro-electric undertakings in the French Departments of Jura and Rhône.

New Zealand's Electrical Imports.

The *Board of Trade Journal* shows that the imports of "electrical equipment, all kinds" into New Zealand during the last quarter of 1929 were valued at £499,390. Of this the United Kingdom was responsible for £294,265, the United States for £127,593, Canada for £30,243, and Australia for £5,986. It is noted that the values given are the current domestic values in the countries of export, plus 10 per cent.

Czecho-Slovakian Export Tax.

An export tax of 2 per cent. *ad valorem* has been imposed by the Czecho-Slovakian Government upon, *inter alia*, electric lamps (including arc lamps), electrical calculating and measuring apparatus, and wireless apparatus.

Unemployment.

There was a decrease of 16,147 in the number of persons on the registers of the Employment Exchanges in Great Britain during the week ended April 14th. At that date the total was 1,660,300, as compared with 1,676,447 on April 7th and 1,153,535 on April 15th, 1929.

The E.D.A. May Programme.

The May programme of the British Electrical Development Association contains a reduced illustration of the second full-page advertisement for its national Press advertising scheme to secure contact with architects and builders, and draws attention to the use of electrical appliances in the kitchen. The suggested window display for the month illustrated in our issue of April 18th (p. 733) features electric fans, and particulars are given in the programme of the materials required for setting out the display. A scheme has been prepared by the Association for members who wish to display electrical refrigerators in their showroom windows during the month. With the approach of the summer the posters designed for May advocate the use of electric fans and irons in the house for coolness and comfort, and electrical refrigeration for preserving food during the hot weather, while the publications for the month also deal with these subjects. Particulars are offered describing easy methods of organising demonstration houses, which it is recommended should be wired in accordance with the E.D.A. Home Wiring Specification. Leaflets are also available on the use of electricity in garages. A suggested advertisement for the local Press is given, and lantern slides are available for advertising in the kinema and theatre. The programme concludes with notes by the director on poster advertising.

For Sale.

Todmorden Corporation Electricity Department has for sale one 300-kW motor-generator, one balancer booster set, one 250-kVA transformer, one six-panel cubicle switchboard, one four-panel switchboard, 400 d.c. meters, and 50 d.c. motors.

Tenders are invited by Stoke-on-Trent Corporation for the purchase of one 350-kW and two 250-kW dynamos, and two 1,000-kW, 3-phase, 50-cycle alternators, and other plant.

The Visiting Committee of the Newport (Mon.) Mental Hospital, Caerleon, has for disposal two generating sets.

(See our advertisement pages to-day.)

Trade Mark Correction.

The trade mark recently registered by MILDRED E. COX for electrical sound-reproducing apparatus is "Phonixion," and not "Phonoxion," as stated in our issue of April 25th.

The British Compressed Air Society.

This Society has been formed to promote and develop the interests of British air compressor, pneumatic tool, and pneumatic appliance manufacturers, and to consider all questions connected therewith, except the relationships between employers and employés. Most of the leading manufacturers in the industry are members of the Society, and have joined together for the purpose of making a united effort to get this class of British machinery more extensively used by means of educational work in the uses of compressed air.

Royal Dublin Society's Show.

At the Royal Dublin Society's Show, which is being held in Dublin from May 7th to 10th, Messrs. PETTERS, LTD., Yeovil, will have a comprehensive display of their lighting plants, oil engines, &c.

The Co-ordination of London's Passenger Transport.

The political correspondent of the *Daily Telegraph* reported last week that the Government intends to introduce next session a measure to transfer the privately-owned transport services of London to public ownership. The correspondent says that he is informed that Sir William McLintock is, and has been for some months, investigating, at the request of the Government, the financial aspects of the problem, and the Minister of Transport (Mr. Herbert Morrison) expects to receive a report from Sir William before Parliament is prorogued in July. It is the intention of the Minister to have legislation drafted during the summer recess, and also to consult with the important interests affected. The Government proposal is to apply the principle of public ownership to the various passenger transport undertakings, while providing for commercial management, so as to ensure vigorous business enterprise. The expectation is that Mr. Morrison's Bill will be ready for introduction next November, and that the Government will make every effort to secure its passage into law before the spring of 1931.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances :—

	CHEMICALS, &c.	Price April 25th	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¾d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£149	£10 dec.
	Grade II ... ... ,, ,,	£106	£5 dec.
	Grade III ... ... ,, ,,	£62	£1 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	9¼d.	1½d. dec.
c	,, Tubes (solid drawn) ... ,,	11½d. to 11¾d.	1½d. dec.
c	,, Wire, basis ... ... ,,	9¾d.	1½d. dec.
c	Copper Tubes (solid drawn) ... ,,	1/1	2d. dec.
g	,, Bars (best selected) ... per ton	£92	£18 dec.
g	,, Sheet ... ... ,,	£92	£18 dec.
g	,, Rod ... ... ,,	£92	£18 dec.
d	,, (Electrolytic) Bars ... ,,	£66	£18 6s.8d.dec.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£76	£ 8 6s.8d.dec.
d	,, ,, H.C. Wire per lb.	9⅞	2⅛d. dec.
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para, fine ... ... ,,	8¾d.	¼d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton	67/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£20	...
g	Lead, English pig ... ... ,,	£19 5s.	15s. dec.
g	Mercury ... ... per bot.	£22 15s. to £22 17s. 6d.	...
e	Mica (in original cases) small ... per lb.	6d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/9½	...
p	,, ,, wire... ... ... ,,	1/6	...
o	Platinum ... ... per oz.	£8 17s.	...
d	Silicium Bronze Wire ... ... per lb.	1/2	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton	£157 10s. to £158	£9 5s. to £9 15s. dec.
n	Wire, Nos. 1 to 16 ... ... per lb.	3/5	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Messrs. James Forster & Co. reported on April 26th that no change was apparent in the general position of the lead market. Demand remained as dull as ever both here and on the Continent, and, although there had been rumours of a decision to cut production to meet the circumstances of the situation, nothing definite was known. The price was down to a level which had not been seen since 1921, but the position was very much worse than it was then, inasmuch as stocks were light at that period, the market being a free one, while at the present time they were very heavy and would always militate against any sustained advance.

Lighting and Power Notes.

Aberdeen.—SUB-STATION EUIPMENT.—The Corporation Electricity Committee has received sanction to the borrowing of £11,676 for sub-station equipment.

Ashton-under-Lyne.—CORRECTION.—A price reduction which appeared in the April 18th issue of the ELECTRICAL REVIEW was wrongly ascribed to the Ashton-under-Lyne undertaking, and referred to a reduction made by the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. The present "all-in" tariff of the Ashton Corporation, as stated in the Special Supplement of the ELECTRICAL REVIEW of April 11th, is 15 per cent. of the rateable value with a minimum of 15 per cent. on £15, plus ¼d. per kWh for all electricity consumed. There has been no change in this tariff since July 1st, 1928.

Australia.—KIEWA HYDRO-ELECTRIC SCHEME REVIVED.—It is stated that the State Electricity Commission of Victoria again has under consideration the erection of a large hydro-electric station on the Kiewa River.

Birmingham.—PROGRESS DURING MARCH.—It was reported at a meeting of the Corporation Electric Supply Committee held recently that during March 1,126 new customers were connected, representing an additional 9,600 lamps in the lighting section and 2,100 h.p. in the power section. In a year the number of consumers has increased from 68,200 to 80,000; and in five years the output has advanced by 60 per cent.

Brazil.—WATER-POWER RESOURCES.—It is estimated that Brazil is now third among American countries with regard to its resources of water power, of which but 5 per cent. has so far been developed. Some time ago the Brazil Federal Department of Transportation and Public Works stated that there were 378 important falls in the country, only 154 of which with a potential of 50,000,000 h.p. had been measured. It is estimated that the remaining 224 will bring this figure to a minimum of 60,000,000 h.p. Preliminary estimates of the Geographic Survey of Brazil differ, however, and give available power estimated at 12,879,000 h.p. at minimum flow, most of which is situated in sparsely populated regions. Some of the principal falls are Sete Quedas, estimated at 500,000 h.p.; Paulo Alfonso, 460,000 h.p.; Urbaupunga, 447,000 h.p.; and Iguassu, 337,000 h.p.

Continental.—FRANCE.—The Société des Usines à Gaz du Nord et d'Est, of Paris, has secured a concession for the construction of an electricity distribution system in the Aisne and Marne Departments of France.

BELGIUM.—The Société d'Electricité Interbrabant has decided to increase the capacity of its power station at Schaerbeek, Brussels, by the addition of eight boilers and four 20,000-kW turbo-generator sets. In order to meet any sudden emergency a 36,000-V connecting transmission line has been erected between the company's power stations at Schaerbeek and Droogenbosch. A connection has also been made with the municipal power station in Brussels.

NORWAY.—A scheme estimated to cost £27,000,000, is under consideration for the conveying of electric power from Norway to Germany. It is proposed to utilise the water power in Telemarken and South Norway to generate electricity and to transfer it to Germany, either through Denmark, or by way of Sweden and across the Baltic Sea to Sassnitz and Lübeck.

Croydon.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £4,731.

Darlington.—MAINS EXTENSION SCHEME.—The Town Council has approved a scheme subject to a grant from the Unemployment Grants Committee, for the laying of mains in all streets in the town which have been made up, covering some 12¼ miles, and for providing services to approximately 4,000 houses.

Edinburgh.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee is considering the introduction of a scheme of assisted wiring to encourage the use of electricity in the poorer localities.

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains in connection with Ashgrove Street and Sauchiehall Lane sub-stations at an estimated cost of £6,503.

Grampians.—HYDRO-ELECTRIC SCHEME PROGRESSES.—After delay owing to stormy weather, work in connection with the Grampian Electricity Supply Co.'s Loch Ericht scheme is again in full operation. Progress is particularly marked at Ardlarich with the erection of a power house, with two 16,000-kW sets, with all the necessary auxiliaries, and tail race of concrete which will discharge the tail waters into Loch Rannoch. It is anticipated that power will be developed here in the late autumn. The steel standards for the cables to carry the supply from Rannoch, *via* Aberfeldy and Abernethy, are being erected. The erection of a 33,000-V line from the company's power station at Arbroath has been completed as far as Tummel Bridge, from which a supply will be available for places *en route*, including Blairgowrie and Pitlochry.

Grimsby.—LOAN.—The Corporation Electricity Committee is applying for sanction to a loan of £12,300 for h.p. feeders, transforming equipment and l.p. cables, required for the supply of electricity to North Thoresby, Waltham, and Humberstone.

Hull.—PROGRESS DURING 1929-30.—In a recent report of the city electrical engineer, it was stated that during the year ended March 31st last the electrical energy generated amounted to 102,842,800 kWh. The number of new consumers connected totalled 7,940, as compared with an average of 2,326 per annum for the past five years.

India.—HYDRO-ELECTRIC DEVELOPMENT.—The first stage in the Jumna-Ganges hydro-electric scheme has been reached by the opening of the hydro-electric generating station at Bhola (Meerut) by the Governor of the United Provinces. This scheme represents the first attempt to utilise canal falls on any large scale in India for the generation of power. In this scheme three falls are being utilised, the electrical energy generated from them being linked up with the general transmission system. From this system power will be supplied to several districts, and to two pumping stations nearby. The electricity developed is calculated at 6,500 h.p. There are thirteen falls between Hardwar and Aligarh and when all are utilised, the total power generated will reach 50,000 h.p.

MADRAS.—The chief engineer for hydro-electric development has submitted a scheme to the Government of Madras for the construction of electrical transmission lines and sub-stations from the Metur Works to Salem and Erode. The estimated cost of the scheme is Rs. 5,50 lakhs.—*Reuter's Trade Service* (Bombay).

Irlam.—ELECTRICITY SUPPLY AGREEMENT.—The Urban District Council has decided to enter into an agreement with the Stretford and District Electricity Board for an electricity supply from Irlam and Cadishead. The approval of the Electricity Commissioners is being applied for.

Japan.—ELECTRICITY GENERATION STATISTICS.—According to returns of the Communications Department, the total capacity of power stations in Japan, including those not yet completed, amounts to approximately 5,000,000 kW. Of those having 20,000 kW and upwards, 24 are operated by water power and 18 by steam power. The power stations at present are capable of an output of 9,697,077,648 kWh per annum, of which 8,588,072,381 kWh can be generated by water power and 1,104,185,406 kWh by steam power.

NEW HYDRO-ELECTRIC POWER STATION.—The erection of a hydro-electric power station having a capacity of 60,000 kW is contemplated by the Oi-gawa Power Co.

London.—BATTERSEA.—The Borough Council Electricity Committee is to undertake the following works:—Electricity services to 92 premises, £757; private services, £359; public lighting, £74; replacement with armoured cable of old vulcanised bitumen distributors, £8,894; changing over from d.c. to a.c., £200.

The Committee also proposes to reduce its charge to consumers who have adopted the rental wiring scheme, for a 6-point installation from 16s. 3d. to 14s. 9d., and for larger installations *pro rata*.

ISLINGTON.—The Borough Council Electricity Committee recommends the following works in connection with its transmission and distribution system:—Highbury Corner: E.h.p. feeder, £2,800; power house and sub-station equipment, £7,600. Essex Road: E.h.p. feeder, £6,300; power house and sub-station equipment, £7,250. Highgate: E.h.p. feeder, £4,000; sub-station equipment, £550. Nag's Head: H.p. feeder, £1,150; sub-station equipment, £350.

POPLAR.—The Borough Council Electricity Committee is applying for sanction to the borrowing of £10,000 for mains extensions. Sanction has been received to loans of £23,710 for services, £10,391 for meters, and £5,899 for wiring installations.

HAMMERSMITH.—The Borough Council Electricity Committee recommends an unemployment relief scheme, estimated to cost £63,884, for the extension and augmentation of its transmission and distribution systems.

Manchester.—UNEMPLOYMENT SCHEME.—Included in works for alleviating unemployment sanctioned by the Unemployment Grants Committee is a scheme submitted by the Electricity Committee for laying l.p. distributors in the city at an estimated cost of £100,000.

Preston.—CHANGE-OVER SCHEME.—The Town Council has decided, subject to assistance from the Unemployment Grants Committee, to spend £151,000 in changing the system of electricity supply from d.c. to a.c.

Special Order.—CENTRAL BOARD TO INCREASE BORROWING POWERS.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Central Electricity Board to increase its borrowing powers.

Stirlingshire.—DISTRIBUTION SCHEMES.—The Scottish Central Electric Power Co. has informed the Stirlingshire Central District Committee that it will commence at an early date the work of erecting distribution systems for the electric lighting of the villages of Plean, Cowie, and Fallin.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to make the following extensions of mains:—Alternative supply to Tunstall and Burslem areas, £3,500; extensions at Wolstanton, £2,600; supply to housing estate at Chell being developed by the Chatterley-Whitfield Collieries, Ltd., £2,000; extensions in Barford district, £1,700; supply to the L.M.S. Railway at Chatterley, £600; supply to Vivian Road estate, Fenton, £220.

CHANGE-OVER.—The Electricity Committee has obtained sanction to a loan of £5,000 in connection with the changing-over of the system.

NEW SUB-STATION.—The Electricity Committee is to erect a sub-station in Barlaston Old Road, Trentham.

Stourport.—NEW GENERATING PLANT.—Arrangements are now proceeding at the Stourport power station of the Shropshire, Worcestershire, and Staffordshire Electric Power Co. for the augmentation of the plant by the installation of an additional 50,000-h.p. turbo-alternator, which will bring the total plant installed up to 150,000 h.p. The company now has a service area of 2,500 sq. miles.

Ulverston.—PRICE REDUCTIONS.—The Urban District Council has approved the following reductions in the charges for electricity: Alternative domestic rate (dwelling houses only): A fixed charge of one-eighth of the rateable value, or depending upon the number of lamps in use and based upon £20 per kW per annum, payable quarterly, plus 1d. per kWh consumed. Flat rate for heating, cooking, and water heating: 1d. per kWh, with a meter rent of 1s. 3d. per quarter.

West Hartlepool.—DOMESTIC SUPPLY SCHEME.—The Town Council Finance Committee is to consider a scheme prepared by the borough electrical engineer for the encouragement of electricity installations in small houses. It is proposed that the Corporation should pay for the installation up to four points and fit slot meters, which would supply electricity at the flat rate of 5d. per kWh, plus a sum to meet the cost of the installation and of the meter, spread over a period of ten years. It is also recommended that with each installation a free iron should be supplied. As an experiment it is proposed that 200 installations of this type should be carried out.

Tramway and Railway Notes.

Accrington.—TRAMWAY ABANDONMENT.—The tramway service on the six-mile route between Accrington and Rawtenstall was discontinued yesterday, and was replaced by a service of motor-omnibuses run jointly by the Corporations of Accrington, Haslingden, and Rawtenstall.

Australia.—PROPOSED ELECTRIC RAILWAY.—The Sutherland Shire Council (New South Wales) has approved the construction of an electric railway from Sutherland to Cronulla, and the laying out of six model suburbs along the route of seven miles, at a cost of £1,000,000. The final decision rests with the Government.

Bradford.—RAILLESS CARS.—The Corporation Tramways Committee has decided to purchase twelve additional railless cars.

Colwyn Bay.—TRAMWAY ABANDONMENT.—The Urban District Council has accepted, with reservations, the offer of the Llandudno and Colwyn Bay Electric Railway, Ltd., to substitute 'buses for trams between Colwyn Bay and Penmaen Head, Old Colwyn.

Continental.—ITALY.—A concession has recently been granted by the Italian Government for the construction of a system of electric railways in the Province of Piacenza. Lines are to be constructed between the towns of Piacenza and Bettola, and Piacenza, Carpaneto, and Lugagnano, with branches between Lusurasco and Fiorenzuola, and between Castel San Giovanni and Pianello.

SWITZERLAND.—The Swiss Federal Railway authorities are preparing plans for the electrification of the railways between Le Locle and the Col des Roches and between Basel and Delsburg.

An electric locomotive having sixteen separate motors producing a total of 7,200 h.p. has been ordered by the Swiss Federal Railways for use on the St. Gothard route.

Croydon.—TRACK RECONSTRUCTION.—The Corporation Tramways Committee, in connection with the further widening of High Street, has arranged for the construction of a double track at a cost of £3,500.

Dewsbury and Ossett.—RAILLESS CARS.—The Dewsbury and Ossett Corporations, who are joint lessees with the National Electric Construction Co., Ltd., of the tramway services in these districts, have accepted the principle of substituting railless cars for trams, subject to the arrangement of satisfactory terms and conditions.

Japan.—RAILWAY ELECTRIFICATION.—The Narita Rapid Transit Electric Railway Co. has completed the survey of its proposed new lines and will start work on their construction as soon as the official sanction is obtained.

The application for permission to construct an electric railway seven miles in length between Tanba-mura, Naka-gun and Kyoto-fu has been granted.

Northern Ireland.—BELFAST.—The Corporation Finance Committee has approved loans of £110,000 for new tramcars and £50,000 for the renovation of old tramcars.

Telegraph and Telephone Notes.

Australia.—Radio-telephony.—Tests having proved to be successful, a radio-telephone service between England and Australia (Melbourne and Sydney) was to be officially inaugurated on April 30th. The service will be maintained between the British G.P.O. station at Rugby and the La Perouse station, near Sydney, of Amalgamated Wireless (Australasia), Ltd

Cable Testing.—Mobile Silence Cabinet.—Siemens Brothers and Co., Ltd., have recently acquired a 30-cwt. Morris-Commercial petrol van chassis which has been fitted with a special body and is intended for use as a mobile silence cabinet for testing trunk telephone cables in noisy streets. In the interior of the van are fitted the necessary instruments for two operators. It is finished in white-painted "Celotex," 7/16 in. thick, and insulating material known as "Absorbit" is packed between the "Celotex" and the panels forming the roof, sides, doors, and the forward bulkhead. Below the double doors at the rear of the van is a box for carrying a length of cable which can be unwound when a test is to be made.

China.—Long-distance Telephony.—By arrangement between the Chinese Ministry of Communications and the Chekiang Provincial Government, work has been started on a long-distance telephone line between Shanghai and Hangchow. It will follow the same route as that of the Telegraph Administration, and for reasons of economy the lines will be erected on the telegraph poles. Some 27 important towns and a number of districts in the province of Chekiang are to be connected by telephone in conjunction with the installation of a provincial long-distance service now being carried out. The project provides for the installation of five main lines in the province, with Hangchow as the centre; 18 of the towns have already been connected.

Automatic Telephony.—Work is approaching completion on the changing over of the telephone system in Hong-kong from manual to automatic operation.

Italy.—Telegraph Service.—According to a recently-issued report of the Italian Department of Posts and Telegraphs, there were 41,133 miles of telegraph lines, representing 326,149 miles of wire, in use in Italy at the end of July last.

South Africa.—Long-distance Telephony.—Johannesburg and Cape Town have been connected direct by telephone with Port Elizabeth. The instrument used at the Cape Town G.P.O. is the "Neophone," a new type which has been developed in conjunction with the British Post Office. It is adapted for automatic telephony and, by the substitution of a dial dummy, for manual exchanges. Normally it is arranged as a table set, with either a combined or a separate bell box.

The Telephone Service.—Rates Comparison.—While Britain has a lower telephone density than the U.S.A., she enjoys cheaper calls. Noteworthy statistics prepared by the Engineering Department of the British Post Office show that, contrary to the opinion very generally held in this country, both business and domestic telephone rates are considerably higher in New York than in London. Rates throughout America tend to vary more than in this country, as the local services are in the hands of many independent companies. British rates are, as nearly as may be, uniform.

In the inner areas the business rates are:—

No. of Calls.	New York.	London.
	£ s. d.	£ s. d.
180 ...	14 7 6 ...	8 15 0
900 ...	14 7 6 ...	11 15 0
1,800 ...	22 16 3 ...	15 10 0

In the outer areas the domestic rates are:—

No. of Calls.	New York.	London.
	£ s. d.	£ s. d.
180 ...	10 10 0 ...	6 5 0
792 ...	10 10 0 ...	8 16 0
1,692 ...	18 10 9 ...	12 1 0

It should be understood that the New York rentals of £14 7s. 6d. and £10 10s. include, respectively, 900 and 792 free calls, the subscriber subsequently paying per call at a decreasing rate as the number increases. The London local rate is, of course, 1d. per call, and its advantage, therefore, while considerable at the lower calling rate, becomes even more marked as the calling rate becomes really high, for each additional call adds nearly twice as much to the New York bill as to the London bill.

Maidstone Automatic Exchanges.—Eight automatic exchanges serving Maidstone and the surrounding districts of Barming, Boughton Mouchelsea, Bearsted, Otham, Aylesford, Wateringbury, and Hunton were brought into operation on April 26th. They were manufactured and installed by Standard Telephones & Cables, Ltd., and have been designed to accommodate 3,360 lines initially with an ultimate capacity of 9,150 lines.

Transatlantic Telephony.—Cable Laying.—About $1,000,000 is to be spent in Nova Scotia during the next few months on the construction of a telephone line to connect with the proposed transatlantic telephone cable of the American Telephone and Telegraph Company. The outlay will be made by the Eastern Telegraph and Telephone Company, a subsidiary. A Bill introduced in the House of Assembly at Halifax providing for the right of way has been favourably received, says the *T. & T. Age*, and the line has already been built through Maine and over part of New Brunswick.

Preparation work has been commenced in England. At Stranraer a survey has been made for a station which, by an extension from Ayr, will be linked with the new telephone cable to be laid between Glasgow and Ayr. Designed in the first place to improve the cross-channel service with Ireland, this new line is likely to be a connecting link with the Ireland-Nova-Scotia transatlantic cable.

Railway Train Service.—On April 27th coherent telephone conversations were carried on between offices in London, England, and passengers travelling on a Canadian National Railway train between Toronto and Ontario. The circuit consisted of land-lines, the transatlantic radio link, and carrier-current telegraph wires erected overhead and parallel to the railway track. The train service normally functions in conjunction with Bell land-line network.

United States.—New Radio Stations.—R.C.A. Communications, Inc., has been granted permission by the Federal Radio Commission to erect eleven new radio transmitters at Rocky Point, N.Y., says the *T. & T. Age*. In granting the permits, the Commission allows the use of channels above 6,000 kilocycles on the condition that they will not interfere with the services of foreign countries. Each of the new transmitters will have a maximum power of 80,000 watts. A number of definite points of communication are named as follows: Warsaw, Oslo, Angora, San Juan, Havana, Amsterdam, Prague, Cartago, Bogota, Paris, Brussels and Beyrut, but the permission adds in each case "and with other stations with which R.C.A. Communications, Inc., stations are licensed to communicate by the Federal Radio Commission."

Radio Notes.

Czecho-Slovakia.—Licences.—The total number of licence holders' receiving sets in use is now 284,432, registered listeners representing 2.4 per cent. of the total population of the country. Blind and totally disabled people and certain classes of schools are exempt from paying the licence fee; their number is at present 1,681. Some 67 per cent. of the receivers in use are crystal sets and the availability of long-distance telephone cables has led to an agreement between various Central European stations for the exchange of programmes between the five transmitting centres of Czecho-Slovakia (namely, Prague, Bruo, Bratislava, Moravská-Ostrava, and Kosice) and Berlin, Vienna, Budapest, Warsaw, and Belgrade, most of their programmes being conveniently receivable on crystal sets.

According to *World-Radio*, a new short-wave station is to be opened this month, chiefly for communicating direct with the U.S.A. Two transmitters are being provided, which will operate on independent wavelengths of from 15 to 20 m. with an aerial power of 20 kW each, or together at double that power.

France.—Parasitic Interference.—Two legal judgments delivered recently are of considerable interest. In the first case the action was brought by a private resident against his neighbour, the proprietor of a café who employed a phonograph, driven by a small electric motor, for the purpose of reproducing dance music. The plaintiff complained that the motor created waves which prevented him from using his wireless receiving set. The judgment of the Court, under article 1382 of the Civil Code, which provides for reparation for prejudice caused by other people, recognised the justification of the claim, ordered the defendant to replace the faulty motor with an efficient one, to pay the plaintiff a fine of Fr. 50 per day in the interval, to pay Fr. 500 damages, and the costs of the action. The second action was of a similar character, in this case a large electric sign being alleged to be the cause of the trouble which prevented a wireless set from being operated. The Court also gave judgment in favour of the plaintiff, ordered the removal of the sign, which, incidentally, had cost several hundred thousand francs to erect, and granted the plaintiff Fr. 10,000 damages. It may perhaps be argued that electric advertising signs are not necessary, and that their owners are not entitled to create a nuisance in using them for their own benefit, but one cannot help wondering what would have been the nature of the judgments if, for example, the troublesome apparatus had been a tramway, or, say, a generating station.

Licences.—Towns.—Excluding London, in which 500,000 listeners are estimated to possess receiving licences, the *Wireless World* states that Birmingham heads the list with 88,476. Manchester follows with 86,578; Liverpool, 74,760; Leeds and Bradford, 70,194; Glasgow, 58,776; Sheffield, 41,345; Newcastle, 38,392. Of the towns provided with relay stations, Dundee contributes the smallest number of licences, *viz.*, 11,356.

North Regional Station.—High Masts.—The B.B.C.'s northern regional station at Slaithwaite will have a materially larger service area than that of the Brookman's Park plant. The latter's two 200-ft. masts are small in comparison with the three 500-ft. masts being erected by the Radio Communication Co., Ltd., for the northern station, in which case height restriction in consideration of aircraft does not apply.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—July 30th. Victorian Railway Commissioners. Turbo-alternators, condensing plant, and control gear. (B.X. 6355.)*
July 8th. Posts and Telegraph Department. Telephonists' telephones. (B.X. 6352.)*
June 17th. Indicators. (B.X. 6333.)*

Bedford.—May 5th. Electricity Department. Supply, delivery and erection of 11,000-V overhead lines and auxiliary apparatus (other than transformers) required for supplying an area of 100 sq. miles. (April 4th.)

Bilston.—May 12th. Urban District Council. Installation of electric lighting in the Market Hall. (Registered contractors only). (April 25th.)

Cheadle and Gatley.—May 6th. Electricity Department. Supply, delivery, and erection of an induction voltage regulator. (April 11th.)

Ebbw Vale.—May 12th. Electricity Department. Supply, delivery and erection of 300-kW automatic rectifier plant, together with switchgear, cables, &c. (See this issue.)

Epsom.—May 12th. Urban District Council. (Section 1.) Supply of kiosks and converting plant. (Section 2.) Supply and laying of e.h.p. and l.p. cables. (Section 3.) Supply only of l.p. cables. (April 25th.)

Gainsborough.—May 16th. Electricity Department. Twelve months' supply of paper-insulated, l.c., d.s.t.a. cables (l.p.) and single- and three-phase meters. (April 25th.)

Glasgow.—May 7th. Corporation. Electric lighting installation for the Cornwadric housing scheme. Specifications, &c., from the General Manager, 75, Waterloo Street, Glasgow, C.2.

Hastings.—May 10th. Electricity Department. Supply and delivery to Broomsgrove power station of boiler fuel for period commencing July 1st, 1930. (See this issue.)

India.—SOUTH INDIAN RAILWAY CO., LTD.—May 9th. Supply of track bonds. (See this issue.)

London.—CENTRAL ELECTRICITY BOARD.—May 5th. Supply, delivery, and erection of 33-kV transmission line, crossing of the river Witham, Boston. (April 4th.)
May 12th. Supply, delivery, and erection of 66-kV and lower voltage transmission lines, and switchgear for the Mid-East England Electricity Scheme, 1929. (April 4th.)
May 12th. Supply of 33-kV and other cables for the North-West England and North Wales Electricity Scheme, 1928. (April 25th.)
May 19th. Construction of site works, foundation works, and buildings in the area of the South-East England Electricity Scheme (London Area). (April 25th.)
ST. MARYLEBONE.—May 5th. Supply of l.p. and e.h.p. underground cables during the period June 1st, 1930, to May 31st, 1931. (April 18th.)

Manchester.—May 5th. Electricity Committee. Supply and delivery for a period of twelve months of 125-, 250-, 500-, 750-, and 1,000-kVA static transformers. (April 18th.)

Middlesbrough.—May 13th. Electricity Department. Supply for 12 months of cables and meters. (See this issue.)

New Zealand.—WELLINGTON.—June 24th. Public Works Department. Outdoor steelwork and 110-kV switchgear for the Waitaki power scheme. (B.X. 6238.)*
July 29th. Auxiliary turbines and generating sets. (B.X. 6356.)*
June 25th. Posts and Telegraph Department. Condensers. (B.X. 6308.)*
July 16th. Government Railways. Four 30-cwt. overhead electric cranes for new goods sheds. (A.X. 9442.)*
AUCKLAND.—June 10th. Harbour Board. Submarine cable. (B.X. 6354.)*

Oswestry.—May 3rd. Electricity Department. Twelve months' supply of fuel and lubricating oils. (April 25th.)

Ottershaw (near Chertsey).—May 17th. Chester Rural and other Councils Joint Isolation Hospital Committee. Electric light installation at Isolation Hospital. (See this issue.)

South Africa.—CAPETOWN.—June 4th. Electricity Department. Heavy current d.c. testing motor-generator set. (B.X. 6341.)*
JOHANNESBURG.—June 12th. S.A. Railways and Harbours. 2,000-V switch units and l.p. switchboards. (B.X. 6365.)*

Staffordshire.—May 24th. Education Committee. Installation of electric light in the infants' council school, Pelsall. (April 25th.)

Stoke-on-Trent.—May 20th. North-West Midlands Joint Electricity Authority. Supply of outdoor type static transformers and outdoor 33-kV switching station. (See this issue.)

Walthamstow.—May 3rd. Electricity Department. Supply, delivery, and erection of one 2,500-kW motor convertor. (April 18th.)

Wolverhampton.—June 4th. West Midlands Joint Electricity Authority. Supply, delivery, and erection at Ironbridge power station of works supply sub-station 3,300-V and 400-V metal-clad switchgear. Supply, delivery, and erection at Ironbridge station of storage battery equipment, comprising emergency stand-by lighting storage battery, 15-kW motor-generator set, battery trickle-charger, milking booster and spare parts. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Ayr.—Town Council. Accepted:—
Installing electric light in 80 houses (£339).—Darroch and Espie (Glasgow).

Ayrshire.—County Council. Accepted:—
Electrical work in connection with the new County offices at Ayr.—Campbell Banks (Irvine).
Installing electric light at Craigs school, Stirling.—Graham and Morton (Stirling).

Bexhill.—Electricity Committee. Recommended:—
Two feeder pillars (£142).—W. T. Henley's Telegraph Works Co., Ltd.
E.h.p. cable.—W. T. Glover & Co., Ltd.

Bury St. Edmunds.—Town Council. Accepted:—
Rotary convertor (£1,236).—Mather & Platt, Ltd.

Congleton.—Town Council. Accepted:—
Switchgear.—A. Reyrolle & Co., Ltd.; G. Ellison.
Transformers.—Metropolitan-Vickers Electrical Co., Ltd.; Ferranti, Ltd.
Kiosk.—Electric Cables, Ltd.
Cables.—Macintosh Cable Co., Ltd.

Coulsdon.—U.D.C. Buildings Committee. Accepted:—
Installation of internal telephone system at Council Offices (£200).—Reliance Telephone Co., Ltd.

Egypt.—CAIRO.—The Egyptian Public Works Department has received 16 British and other European tenders for carrying out the Nile Delta electricity scheme. Callender's Cable Co. submitted the lowest tender, namely, £E505,000, and the Entreprises Générales Electriques et Industrielles submitted the highest, £E1,196,000. The General Electric with the Brown-Boveri Co., of Mannheim, quoted £E511,000, Siemens Brothers £E545,000, Savigliano, of Turin, £E556,000, Elektro-Entreprises, of Paris, £E567,000, Allgemeine Electricitäts Gesellschaft, of Berlin, £E584,000, British Insulated Cable £E602,000, Elin, of Vienna, £E619,000, Societa Edison, of Milan, £E701,000, and Mausermann £E872,000.—*Reuter* (Cairo).

Faversham.—Town Council. Accepted:—
Wiring houses under the assisted wiring scheme at £1 2s. 6d. per point for 4 lights, £1 1s. 6d. per point for 5 lights, £1 1s. per point for 6 or more lights, and £1 4s. 6d. extra for a power point.—Philpott & Son (Canterbury).

Hounslow.—Urban District Council. Accepted:—
Supply of 100 fluted lamp columns (£290).—A. C. Woodrow & Co.

Government Contracts.—The following contracts were placed by the various Government Departments during March, 1930:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.

W/t amplifiers.—Marconi's Wireless Telegraph Co., Ltd.; H. W. Sullivan, Ltd.
Electric cable.—Enfield Cable Works, Ltd.; General Electric Co., Ltd.
Cells.—General Electric Co., Ltd.
Cable clips.—Aston Chain & Hook Co., Ltd.
Crucibles.—Carborundum Co., Ltd.
Electric lighting fittings.—Edison Swan Electric Co., Ltd.; Engineering & Lighting Equipment Co., Ltd.; General Electric Co., Ltd.; Gabriel & Co., Ltd.; Hawkers, Ltd.; W. McGeoch & Co., Ltd.; Player and Mitchell, Ltd; Rainsford & Lynes, Ltd.; Revo Electric Co., Ltd.
Fuses and components.—W. McGeoch & Co., Ltd.; Hawkers, Ltd.; Engineering and Lighting Equipment Co., Ltd.; Weekes (Luton), Ltd.; Bertram Thomas.
Gearing and electrical equipment for drainage pump.—Fullerton, Hodgart & Barclay, Ltd.
L.p. motor-generators.—Veritys, Ltd.; Mawdesley's, Ltd.
Cable installation.—G. E. Taylor & Co.
Electric lamps.—General Electric Co., Ltd.
Switchboard and spares.—Whipp & Bourne, Ltd.
Switchgear.—George Ellison, Ltd.; Ferguson, Pailin, Ltd.
W/t tuners and amplifiers.—Radio Instruments, Ltd.
Electrical varnishes.—Davis Bros.; Gittings & Hills, Ltd.; Indestructible Paint & Standard Varnish, Ltd.; Jenson & Nicholson, Ltd.; London Varnish and Enamel Co., Ltd.
Wavemeters.—H. W. Sullivan, Ltd.; Radio Instruments, Ltd.
Aerial wire.—F. Smith & Co.

WAR OFFICE.

X-ray apparatus.—Ilford, Ltd.

AIR MINISTRY.

Ammeters and voltmeters.—Everett, Edgcumbe & Co., Ltd.
Condensers.—Dubilier Condenser Co. (1925), Ltd.
Generators.—W. Mackie & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Cable.—Brown, Lenox & Co., Ltd.
Copper conductors.— Whitecross Co., Ltd.
Electric lamps.—General Electric Co., Ltd.
Overhead line material.—Callender's Cable & Construction Co., Ltd.
Signalling material.—Siemens & General Electric Railway Signal Co., Ltd.
Static transformers.—English Electric Co., Ltd.; Metropolitan-Vickers Electrical Export Co., Ltd.
Surge absorbers.—Ferranti, Ltd.
Telephone materials.—Ericsson Telephones, Ltd.; Standard Telephones & Cables, Ltd.
Wireless transmitter.—Marconi's Wireless Telegraph Co., Ltd.

POST OFFICE,

Telegraph apparatus.—Creed & Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Testing apparatus.—Automatic Telephone Manufacturing Co., Ltd.
Wireless apparatus.—Standard Telephones & Cables, Ltd.
Cable.—British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.
Earth clips.—F. Showell & Sons, Ltd.
Loading coils.—General Electric Co., Ltd.; Standard Telephones & Cables, Ltd.
Cords for telephones.—Phœnix Telephone & Electric Works, Ltd.
Ducts.—Albion Clay Co., Ltd.; Doulton & Co., Ltd.; J. Jameson & Son, Ltd.; Oates & Green, Ltd.; Sutton and Co. (Overseal), Ltd.
Jointing sleeves.—Dugard Bros., Ltd.; C. M. Powell Bros.
Solder.—G. W. Neale, Ltd.
Wood troughing.—Armstrong Addison & Co.
Wallboards.—H. J. Townsend & Son.
Annealed copper wire.—Elliotts Metal Co., Ltd.
Batteries, Douglas (Glasgow) Telephone Exchange.—Alton Battery Co., Ltd.
Manufacture, supply, drawing-in, and jointing cable. Peterborough—Market Deeping.—Siemens Bros. & Co., Ltd.; Canterbury-Seabrook (Kent).—Standard Telephones & Cables, Ltd.; Liverpool—Colwyn Bay.—British Insulated Cables, Ltd.
Conveyors, Leeds Head Post Office.—A. Saivée & Co., Ltd.
Electric lifts, Terminus (London, W.C.) Telephone Exchange.—J. Bennie, Ltd.; Birmingham Head Post Office.—Smith, Major & Stevens, Ltd.
Electric lighting Telephone House, London, E.C.—G. A. Weston.
Telephone exchange equipment: Crawley (Sussex); Holborn and Tandem, Clerkenwell (E.C.).—Automatic Telephone Manufacturing Co., Ltd. Post Office Stores Department.—Standard Telephones & Cables, Ltd. Southall (Middlesex).—Standard Telephones & Cables, Ltd. Sub-contractors: Electric Construction Co., Ltd., for charging machines; Crompton Parkinson, Ltd., for ringing machines; Hart Accumulator Co., Ltd., for batteries.
Telephone repeater equipment: Torquay; Guernsey (C.I.); Birmingham; Aberdeen.—General Electric Co., Ltd. Leeds.—Standard Telephones & Cables, Ltd.

H.M. OFFICE OF WORKS.

Whitehall area rectifier equipment.—Hewittic Electric Co., Ltd.

Hull.—Tramways Committee. Accepted:—
Feeder cable (£5,279).—Siemens Bros. & Co., Ltd.

Irish Free State.—DUBLIN.—The following are among contracts placed by the Controller of Stores, Department of Posts and Telegraphs, during the months of January, February, and March, 1930:—
Magdyno spare parts.—Taylor Bros.
Wire (bronze and h.d. copper).—Finspongs Metallverks Aktiebolag.
Bell sets.—General Electric Co., Ltd.
Cable.—Victor Zorn; Siemens-Schuckert (I.), Ltd.; Suddeutsche Kabelwerke; and Dr. Cassirer & Co., A.G.
Cable terminals.—Cook Electric Co.
Indicators.—International Electric Co., Ltd.
Insulators.—W. F. Dennis & Co.
Jacks (telephone).—Sterling Telephone and Electric Co., Ltd.
Keys (telephone).—Phœnix Telephone and Electric Works, Ltd.
Relays.—International Electric Co., Ltd.
Telephone instruments and parts.—Automatic Telephone Manufacturing Co., Ltd.; Irish Telephone (New System), Co., Ltd.
Lamps.—Phœnix Telephone and Electric Works, Ltd.
Plates (earth).—F. Braby & Co., Ltd.

London.—HAMMERSMITH.—Electricity Committee.
Supply of 96 terminal cable units (£326).—W. Lucy & Co., Ltd.
11,000-V cables between Generating Station and Scrubs Lane Sub-station:—

	£
PIRELLI-GENERAL CABLE WORKS, LTD. (Recommended)	27,742
Macintosh Cable Co., Ltd.	27,872
Enfield Cable Works, Ltd.	28,181
Standard Telephones & Cables, Ltd.	28,374
Siemens Bros. & Co., Ltd.	28,464
W. T. Henley's Telegraph Works Co., Ltd. ...	28,663

AIR MINISTRY.—
Supply of electric lamps.—Siemens Electric Lamps and Supplies, Ltd.

SHOREDITCH.—Electricity Committee. Sub-station switchgear:—

Name of Tenderer.	Section 1. Central Electricity Board.	Section 2. Borough Council.	Total price, including provisional sum of £750.
Switchgear & Cowans, Ltd.	7,439	5,302	13,491
Ferguson, Pailin, Ltd. ...	7,423	6,381	14,554
English Electric Co., Ltd. ...	7,724	6,551	15,024
General Electric Co., Ltd.	7,776	6,581	15,106
A. Reyrolle & Co., Ltd. ...	8,068	6,750	15,567
British Thomson-Houston Co., Ltd.	8,479	7,015	16,244
Metropolitan-Vickers Electrical Co., Ltd.	8,607	7,309	16,666

The Committee recommends that the tender of the General Electric Co., Ltd., be accepted for Section 1, items C to I inclusive, amounting to £5,473, and Section 2, items J, K, L and N amounting to £3,648, making with provisional sum of £750 a total of £9,871; and that the tender of Switchgear and Cowans, Ltd., for item M (Section 2), seven l.p. d.c. feeder panels, £1,701, also be accepted.

INDIA STORES DEPARTMENT:—
10,000 telegraph insulators.—Equipment & Engineering Co., Ltd.

Manchester.—Transport Department:—
Two electro-magnetic crack detectors.—Equipment & Engineering Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—
Cables in connection with the change-over.—Pirelli-General Cable Works, Ltd., h.p. cables (£23,220); Union Cable Co., Ltd., l.p. cables (£38,114).

Forthcoming Events.

Faraday Society.—Friday, May 2nd. Burlington House, Piccadilly, W. 8 p.m. "Coagulation." Prof. Dr. G. Wiegner.

Institution of Civil Engineers.—Tuesday, May 6th. Institution, St. George Street, S.W. 6 p.m. Thirty-sixth James Forrest Lecture on "Aeronautical Progress, 1914-1930." Prof. R. V. Southwell, F.R.S.

Illuminating Engineering Society.—Tuesday, May 6th. Royal Society of Arts, John Street, Adelphi, W.C. 7 p.m. "Luminous Traffic Signals." Mr. T. Austin.

Television Society.—Tuesday, May 6th. University College, Gower Street, W.C. 8 p.m. "Liquid Photo-electric Cells." Mr. R. Neville-Gray.

Institution of Electrical Engineers (Wireless Section).—Wednesday, May 7th. Institution, Savoy Place, W.C. 7 p.m. "A Wireless Broadcasting Transmitting Station for Dual Service." Messrs. P. P. Eckersley and N. Ashbridge.

(South Midland Students' Section).—Tuesday, May 6th. University, Birmingham. 7.30 p.m. "Routine Testing of D.C. Machinery." Mr. A. H. Slade.

(London Students' Section).—Friday, May 9th. Institution, London, W.C. 6.15 p.m. Annual general meeting. "The Rotary Automatic Telephone System." Messrs. J. W. Moffatt and J. C. Emerson.

Institute of Metals.—Wednesday, May 7th. Institution of Mechanical Engineers, Storey's Gate, S.W. 8 p.m. "The Influence of Technique on Research." Major F. A. Freeth.

Physical Society.—Friday, May 9th. Imperial College of Science, South Kensington. 5 p.m. Ordinary meeting.

Notes.

Electric Poultry Heaters.

In the monthly report of the Lancashire Utility Poultry Society it is recorded that by the application of radiant heat in place of the usual heating elements in electric brooders most of the troubles associated with the latter are eliminated. The objectionable feature of brooding by electricity has always been the "sweating" of the chicks, and no matter how the ventilation of the brooder was planned the difficulty could not be overcome. Whatever the subtle difference between ordinary heat and radiant heat, it certainly seems a vital one when chick breeding is concerned. Where electricity is available at an economic price, as it is in the Preston area, economic production should become more of a reality. "From one season's experience of radiant heating," states the report, "it can be said without exaggeration that, all other things being equal, in large to small unit rearing the chickens are brighter, cleaner, and better developed under radiant heat than under any other system at present practised."

The Belgian Grid.

Like many other countries, Belgium has recently decided to adopt the "Grid" system, and we are informed by Mr. R. A. White, of Charleroi, that a "grid company" has been formed in order to wed the individual advantages of steam and waste-heat power stations to the furtherance of national prosperity by a reduction in the cost of electrical energy.

With a view to rendering the true benefits resulting therefrom more apparent, a special tariff was evolved by Mr. F. Courtoy, of the consulting firm of that name, for controlling the sale and purchase of power. In order to induce private power companies to participate in the scheme, a tariff had to be chosen, whereby the amount which any such enterprise would be called upon to pay or receive from the grid company should be approximately equal to the reduction or increase in its operating cost under the grid system, as compared with the independent-running costs.

Co-operation between stations of different characters and capacities from its very essence led to the realisation of a definite profit for the grid company, enabling it to distribute a dividend, both in the form of interest on the capital involved as well as a bonus on the kWh interchanged, thereby assuring for the participants a constant interest in the scheme.

The design of a tariff corresponding to these requirements was in itself interesting; the basic assumption was made that the cost in any station could be divided into:

(a) The interest and depreciation on the capital involved, which is independent of the operation of the station but which is dependent on the character and capacity of the plant installed.

(b) The no-load running costs, which might be termed the overhead working expenses independent of the load on the station but dependent on the running time.

(c) The fuel costs over and above that required to maintain the station running on no-load, and therefore depending on the kWh supplied.

To represent these three costs, Mr. F. Courtoy utilises the letters "r," "f," and k," respectively, whence the appellation "Erefka System." It has been found that although the values of "r," "f," and "k" vary considerably from one undertaking to another, they remain appreciably constant for similar plant, thus enabling costing tables based on mean values to be compiled.

Should a private station forming part of this grid be required to run at no-load and therefore to receive power from the grid, the grid company could base its charge for power on "k" only, whereas, if the station were closed down altogether, the grid company could base the charge on both "f" and "k." In the third case, in which a private concern when working its station at full load was unable to supply its own needs, the cost of any extra power taken from the grid would be based on "r," "f," and "k." From this it is clear that the cost of interchange of energy between the grid company and any undertaking connected thereto is extremely variable.

Developed in the form of small independent "grids" covering important industrial areas, including many waste heat stations, this organisation is rapidly growing in importance, and, from its inception, has been proved sound both practically and financially.

Low-temperature Carbonisation Plant Tests.

A recent publication of the Department of Scientific and Industrial Research (H.M. Stationery Office, price 9d. net), contains a "Report of test by the director of fuel research on the 'Babcock' low-temperature carbonisation plant installed at the Dunston power station of the Newcastle-upon-Tyne Electric Supply Co., Ltd." A description is given of the plant tested and of the alterations which were made for test purposes. The coal is carbonised by means of the sensible heat carried in the flue gases from a separate combustion chamber in which coke-oven gas is burned, steam being added to the combustion gases to regulate their temperature prior to their entrance into the retort. A certain amount of air admitted with the flue gases assists in providing the necessary heat by the combustion of a small quantity of the coke in the retort. The whole plant, of which the retort forms a part, is designed for the production of power, the solid smokeless fuel being crushed at the outlet of the retort and discharged direct on to the chain grate stoker of a Babcock & Wilcox boiler. The crushers are designed to produce a sized coke suitable for the purpose. Such portions of the coke as were of sufficient size formed a satisfactory domestic fuel.

The rated capacity of the drier and retort is 30 tons per day. During the test 150 tons of coal (9.8 per cent. moisture) were treated during 120.5 hours, so that this rated throughput was realised. In the plant, as tested, it was necessary to clean out the gas filter and recharge it with fresh coke at intervals of about 12 hours, and it was impossible to do this without discharging the volatile products to atmosphere. During these periods no coal was charged to the retorts, and the amount of steam and flue gas supplied was reduced; the total period during which the volatile products were passed to atmosphere during the test was 7.3 hours. Owing to the loss thus incurred, the weight balance does not serve as a criterion of the accuracy of the test. A leakage of water into the system from the condenser and of air into the retort and gas mains, caused an increase of products over materials measured in.

The carbon balance, which includes all the loss of the carbon in the volatile products during the cleaning periods, shows a loss of 4.5 per cent. This balance indicates that the test was satisfactory. The yields of products calculated per ton of coal as charged to the retort and also per ton of dry coal were:—

	As charged.	Dry.
Coke (cwt.)	14.65	15.04
Tar (gal.)	16.4	16.8
Spirit, scrubbed from gas (gal.) ...	2.5	2.6
Gas (cu. ft.)	37,690	38,700
Gas (therms)	26.38	27.09

The coke produced was of suitable size for firing in the boiler. The coke contained 15.5 per cent. volatile matter and gave on distillation a small yield of tar. The tar produced resembles, in chemical composition, a tar made from a coal of similar properties carbonised in retorts externally heated to 500-550 deg. C. The yield of tar is 16.8 gal. per ton of dry coal, representing a yield of 56.9 per cent. of the yield from the Gray-King assay. No practical difficulties were encountered in the operation of the retort.

Architecture for Illuminating Engineers.

Two courses in the fundamentals of architecture for illuminating engineers are being organised by the Illuminating Engineering Society, New York. One of these courses, limited to 75 registrations, will be held at the Architectural League Club House, New York City, under the auspices of Columbia University, September 8th to 13th, inclusive; and the other, limited to 100 registrations, will be held concurrently at the Art Institute, Chicago, by the Schools of Architecture of the University of Illinois and the Armour Institute. Both courses will consist of two lectures each day for five days, and on the morning of the sixth day a general open forum will be held to summarise the work. A nominal fee of $25 will be charged for registration, and this will cover all expenses including transportation for inspection trips. Complete information with syllabus of the lectures will be distributed at an early date, and registrations for the courses will be accepted from members of the Illuminating Engineering Society on receipt of the registration cards attached to the syllabus.

Distance Travelled by Lightning Wave.

Data given in the *Electrical World* indicate that a badly exposed section of a line can be highly over-insulated without much danger of subjecting the normally insulated section to excessive voltages. It is only necessary to extend the highly insulated line several spans beyond the exposed section. The distances of travel for reductions to 50 per cent. and 80 per cent. of the original voltages are given as follows:—

Lightning Voltage, kV.	To Half Voltage. Miles.	To 0.80 Voltage. Miles.
4,000	1.5	0.4
3,000	2.1	0.5
2,000	3.0	0.7
1,000	6.3	1.6

A New Photo-electric Cell.

A new type of photo-electric cell which converts light directly into current has, according to *Science*, recently been produced. The essential part of the cell is a sandwich of copper-oxide between two layers of metallic copper.

Ordinary photo-electric cells, consisting of a layer of a metal such as potassium inside a glass bulb containing either a vacuum or a small amount of inert gas, can only be operated with an auxiliary source of electric current. When light falls on the potassium layer, electrons are given off. When connected to a battery, or other source of current, the electrons are carried to another metal plate or wire which forms the other electrode. Thus, the flow of the current is regulated by the amount of light falling on the potassium layer.

In the new cell, the light falls on one of the thin copper layers, and the electrons are driven off, pass through the copper-oxide layer, which is exceedingly thin, only a few layers of molecules in depth. When they reach the other layer of copper an electric current results. Because of the short distance through which the electrons have to travel, the cell operates without the slightest appreciable lag. The current given off is so powerful that when a rapidly flickering light shines on the cell, the current can be fed into a loud-speaker, and a note vibrating at the same rate as the light can be heard.

Other advantages of the copper cell are that it does not show fatigue as does the ordinary type, it can be operated indefinitely without loss of efficiency, and it is much more sensitive to the infra-red waves that are too long to be visible.

Educational.

London: Polytechnic, Regent Street, W.—A special course of six lectures on "Thermionic Valves" will be given by Mr. W. H. Date on Wednesdays commencing May 7th (no lecture will be given on June 11th), from 6.30 p.m. to 8.30 p.m. Fee for the course, 7s. 6d.

The Governing Body of the Manchester Municipal College of Technology (University of Manchester) offers a limited number of research scholarships in technology. The value of each scholarship will not exceed £100, and will be tenable during the session 1930-31 in the College. Research may be undertaken, *inter alia*, in any of the following departments: mechanical, electrical, and municipal engineering. Applications must be received on or before June 27th, 1930. Forms of application and all information may be obtained by written application to the Registrar of the College.

Steel versus Wood Pole Crossarms.

Comparison between steel and wood crossarms on 66-kV wood-pole lines has been made, according to the *Electrical World*, by the Oklahoma Gas & Electric Company. The comparison covers three lines in the vicinity of Oklahoma City which, up to 1929, had been equipped with grounded steel crossarms and four insulator units per phase. Tabulations of outages and burn-downs attributed to flash-overs for 1928, previous to the change to wood arms, and outages in 1929, after the change, give evidence in favour of the latter construction.

Line	Miles, Length	Outages 1928	Outages 1929	Wires Burned Down 1928	Wires Burned Down 1929
A	20	18	8	4	1
B	30	20	16	11	0
C	40	41	23*	8	4*

* Six months of 1929.

A Floating Power Station.

The *Wall Street Journal* reports that the United States Shipping Board has authorised the sale of the s.s. *Jacona* to the New England Public Service Co., of Augusta, Maine, for $25,000, with the understanding that the purchasers will convert her into a floating power plant within a year at the cost of not less than $1,000,000. Machinery and equipment not useful to the ship after conversion is to be scrapped. As a floating power station, the vessel will be equipped with two 10,000 kW steam turbo-generators of the oil-burning type, and four high-pressure water-tube boilers. The intention of the purchasers is that the ship will be used for transmitting power to coast cities of Maine and New Hampshire for the benefit of newly-established industries where land power-facilities are not yet available.

Appointments Vacant.

Electric cookery demonstrator and showroom assistant for Darlington Corporation.

Engineer and manager, electrical engineer, electrician, and station engineers required in connection with the Kano water and electric lighting schemes in Nigeria.

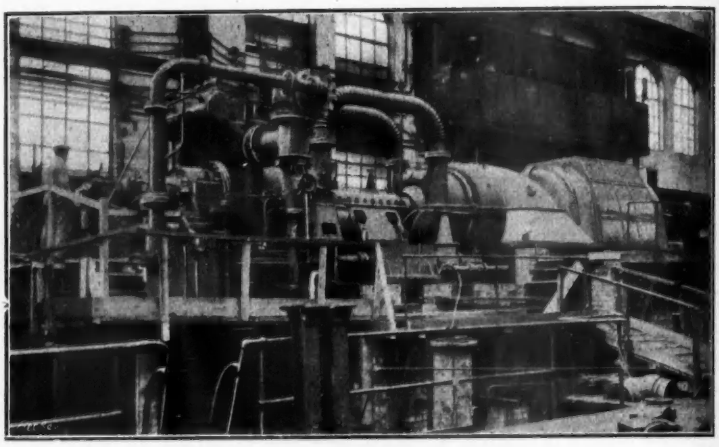
Plumber-jointer for Barrow-in-Furness Electricity Department.

Electrical engineer for the Mains Department of the Calcutta Electric Supply Corporation, Ltd.

(See our advertisement pages to-day.)

High-temperature British Plant for America.

In his address at the annual meeting of the British Thomson-Houston Co., Ltd., Mr. W. C. Lusk (chairman) referred to a turbo-alternator, which is now being tested at the company's works, for an American power company. This is a 10,000-kW, 3,600-r.p.m. turbo-alternator for the Delray power station of the Detroit Edison Company. The turbine is designed for steam at a pressure of 400 lb. per sq. inch, and total temperature of 1,000 deg. F., which, it is claimed, is a much higher temperature than has been tried anywhere else in the world. An exceptionally high overall efficiency is anticipated. The set in question is shown in the accompanying illustration.



A B.T.H. 10,000-kW Set for America.

The Electrical Association for Women.

On April 24th, members of the Birmingham and Midlands Branch of the Electrical Association for Women had the pleasure of hearing Mr. T. Catten give a most interesting lecture on "Electric Lighting in the Home and School." Excellent slides were used for this lecture.

At a meeting of the South Wales and Monmouthshire Branch of the Association on April 22nd Mr. J. W. Beauchamp, engineer and manager of the South Wales Power Company, treated the highly technical and complicated subject of "Tariffs" in a very clear and lucid manner. Following the lecture, Mrs. C. T. Allan, who recently retired from the chairmanship of the branch, was presented by the new chairman (Mrs. C. G. Morley New) with a mahogany bureau.

Export of Electricity from Norway.

The export of electricity from Norway is being taken up seriously. A meeting was recently held at Oslo, attended by about 30 people, at which, after a discussion on a report of the work already done, it was decided to appoint a bigger committee to prepare for a later meeting at which the question of forming a research company will be brought up.—*Reuter's Trade Service* (Oslo).

Mines Department Testing Station.

The Secretary for Mines announces that, for reasons of administrative economy, and also with a view to securing closer collaboration between the staffs of the Mines Department Testing Stations and the Safety in Mines Research Board, he has decided, in agreement with the Board, to transfer the Testing Station from the existing premises (at 42, Arundel Street, Sheffield) to a portion of the buildings occupied by the Board in Sheffield. The removal of the testing apparatus and plant will probably cause some slight delay in the official testing of safety lamps, electric bells, and relays, telephones, &c., but every effort will be made to reduce such delay as much as possible. The address of the new Testing Station will be: Mines Department Testing Station, St. Thomas Street, Sheffield, and on and after Monday, May 5th, all goods and correspondence should be sent to this new address. The Station will remain, as heretofore, under the direction of the Superintending Testing Officer, Captain C. B. Platt, M.B.E. The telegraphic address and telephone number will also remain unaltered, *viz.*: Telegraphic Address, "Testing, Sheffield"; Telephone Number, Sheffield 23082.

British Standard Railway Signalling Symbols.

The British Standard Railway Signalling Symbols (Part I), dealing with schematic symbols, has just been issued by the British Engineering Standards Association. The symbols do not attempt to show the component parts of the apparatus to be used. They have been so designed that they may be combined with each other where one does not adequately represent the complete device. For convenience of reference the symbols have been divided into the following seven sections and numbered, an alphabetical list being given at the end of the document: signals, semaphore, and light; points; track details; apparatus; controls; level crossings; and buildings. Part 2, which it is hoped will be completed in a few months' time, will cover the wiring symbols, *i.e.*, the symbols for the actual apparatus used with their electrical connections, and written circuits or simplified wiring diagrams.

Copies of this new British Standard may be obtained from the British Engineering Standards Association, Publications Dept., 28, Victoria Street, London, S.W.1. Price 2s. 2d. post free.

A New Refrigerant.

A new gas for the coils of electric refrigerators have been developed in the laboratory of a large electric refrigerator company in Dayton, Ohio, and it very closely approaches the refrigerating engineer's notion of an ideal substance for the purpose. The new gas is, *Science* states, a compound of carbon, chlorine, and fluorine, and is akin to carbon tetrachloride, widely sold under a variety of trade names and used for such diverse purposes as grease-spot removing, fire extinguishing, and insect exterminating. It is non-poisonous and non-inflammable. Carbon tetrachloride is one of the two ingredients that are used in making it, the other being a less-known compound, antimony fluoride. The new refrigerant is the invention of Mr. Thomas Midgley, Jr., the developer of ethyl gasoline, and a Belgian chemist, Dr. A. L. Henne.

National Smoke Abatement Society.

An appeal by the above Society, president, Dr. H. A. Des Vœux, M.D., is being made by means of a specially produced folder, "Smoke Abatement as a Sales Factor." It is pointed out that the indictment against smoke is now fairly complete, and, as it covers a wide and varied field, it should be possible to bring home the fact that it is the concern of all, and that the use of smokeless methods must become universal. On the industrial side of the question, efficiency and economy in fuel are, in general, carefully considered, but in the domestic sphere the coal fire holds its own largely through tradition. The present annual consumption of 40 million tons of raw coal for domestic use must ultimately be replaced by an equivalent in smokeless mediums. Included on the Council of the Society are representatives of such bodies as the British Medical Association, the Institution of Electrical Engineers, and the Institution of Heating and Ventilating Engineers. The central offices of the Society are at 23, King Street, Manchester, and the London offices are at 71, Eccleston Square, S.W.1.

Motor-cycles versus Vans.

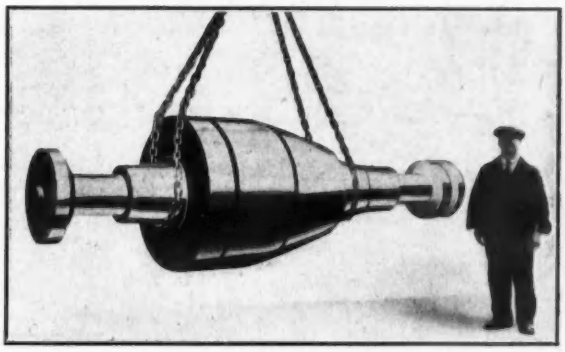
The practicability of using motor cycles with variously-equipped sidecars to replace 20-, 30-, and 40-cwt. vans and lorries is demonstrated by the savings realised by the Transmission and Distribution Department of the New York Edison Company. The annual saving realised per motor-cycle combination varies from £280 to £600, which figures represent the difference between the costs of running the motor-cycles and of obtaining equivalent transport on the basis of hourly charges for vans and trucks furnished by the Transportation Department of the company. So far thirteen motor-cycles have been put in service by the Edison Co. Two are used by the Meter Department for delivering meters to consumers' premises and also for returning meters to the storeroom. The drivers of the cycles attend to the delivery and collection of the meters, which are placed in the sidecars on felt-cushioned shelves to prevent damage from shock and vibration. The Street-lighting Division uses two machines in its work of maintaining street lamps in good condition. The Transmission Department is using nine cycle outfits for the transport of materials and tools to various points where work is in progress, and for the speedy conveyance of workmen to various locations in connection with maintenance work on feeder and junction boxes. The quantities of material and tools to be transported are comparatively small, but the distances to be covered are great. The Cable-splicing Division of the Transmission Department is also now using four splicers' motor-cycle tool carts. To the thirteen machines which have been in service for the past ten months the New York Edison Co., in view of their economy and satisfactory service, proposes to add another seventeen machines in the near future.

Oil Surveying by Wireless.

All "responsible" applicants are to be granted wireless facilities for oil exploration in the U.S.A., and the American Federal Radio Commission has allotted five short-wave frequencies specially for the purpose. The method employed by surveyors is to transmit a radio signal simultaneously with the detonation of a subterranean explosion of dynamite. By measuring the time lag between the reception of the radio signal and the sound, it is possible to determine whether oil deposits exist in the territory between the transmitter and receiver.

Large Rotors for Turbines and Alternators.

The increasing size of turbo-alternator sets with one-piece rotors for the turbines and alternators is to a large extent governed by mechanical stresses permissible in the rotor. It is safe to say that the design is dependent upon the resources of the metallurgist. The manufacture of a large one-piece rotor forging is a difficult and, indeed, a hazardous operation. Even when every precaution which long experience of steel-making, ingot-casting, forging, and heat-treatment can suggest has been taken, the resulting rotor is frequently not allowed by the forgemaster to go forward to the customer, and the great care and expense is found to be wasted. In such cases a second forging has to be made. The various steps which are comprised in the manufacture of such forgings are therefore very carefully controlled. The ingot is cast from acid open-hearth steel made from selected scrap pig-iron, low in sulphur and phosphorous, with the necessary alloy (nickel and chrome) additions. It is cast in octagonal or dodecagonal ingot moulds with very liberal sinking heads. The shape of mould is chosen to minimise internal stresses in the ingot as the steel solidifies, and the very large sinking head localises segregation and piping in the upper portion of the ingot, which is afterwards discarded. The heating of these large ingots (which weigh from two to three times as much as the finished forging), the forging operations, and the subsequent heat treatment are all carried out with extreme care to avoid internal cracks or



A Large Turbine-Rotor Forging.

stresses which might lead to cracks. The rotor, as delivered to the turbine maker, should exhibit a high yield point, and test pieces taken from portions of the forging mutually at right angles (*i.e.*, radially, longitudinally, and tangentially) should show substantially identical results. The accompanying illustration shows a large one-piece rotor in the rough machined condition as delivered to the turbine maker. This particular rotor was forged by Messrs. Steel, Peech & Tozer, of the United Steel Companies, Ltd., for the English Electric Co., Ltd. It has a length of 11 ft. 5 in., and a maximnm diameter of 3 ft. 3 in. The test results are as follows:—

Test Piece.	Maximum Tensile Stress. tons.	Elongation. per cent.	Reduction of Area. per cent.	Yield Point. tons.
Longitudinal	41.33	27.5	48.5	24.1
Radial	40.26	24.0	33.5	23.2
Tangential	39.55	26.5	37.8	23.2

The physical properties of this large rotor forging are typical of present-day practice, and as such are noteworthy. The close agreement between the tests taken in the longitudinal, radial, and tangential directions is exceptionally interesting.

Cable Water-immersion Tests.

The immersion in water of lead-covered power cables for the purpose of detecting faults in the sheathing is discussed by Mr. E. A. Beavis, B.Sc., A.M.I.E.E., in the April issue of the I.E.E. *Journal*. Tests carried out at the Woolwich works of Messrs. Siemens Brothers & Co., Ltd., to determine the time needed to reveal such defects in various cable samples at different water pressures are outlined, and the conclusion is drawn that, except possibly in the case of low-voltage cables, such defects will not be discovered during factory routine. The author therefore suggests that for high-voltage cables, at least, water-immersion should be definitely discontinued.

Institution of Electrical Engineers.

Faraday Medal.—Preceding the delivery of the twenty-first Kelvin lecture by Mr. R. H. Fowler, F.R.S., who described "Some Recent Advances in the Electron Theory of Metals," at yesterday's meeting of the Institution, the ninth award of the Faraday medal was made by the Council to Sir Ernest Rutherford, O.M., F.R.S.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

We have already reported that Mr. H. A. CURTIS, chief engineer and general manager of the Tasmanian Government Hydro-Electric Department, is to be chairman of the newly-formed Hydro-Electric Commission of Tasmania. It is now announced that Mr. Curtis will be assisted by Mr. C. B. DAVIES, formerly engineer to the Hobart Municipal Tramways, and Mr. M. W. SIMMONS, a member of the legal profession.

The Hammersmith Electricity Committee recommends the appointment of Mr. J. SLEIGH as an engineer-in-charge at a salary of £359 per annum. Mr. Sleigh at present holds a similar position in the South Shields undertaking.

Messrs. Merz and McLellan announce the introduction of Mr. J. R. BEARD and Mr. R. W. GREGORY into partnership.

Mr. L. F. FOGARTY, M.I.E.E., managing director of the Zenith Electrical Co., Ltd., was recently elected to the Ruislip-Northwood Urban District Council.

The French Academie des Sciences has recently awarded the Gaston Planté prize to M. CHARLES FERY for his work in connection with the theory of lead accumulators.

The Battersea Borough Council Electricity Committee reports that Mr. F. H. HOWELL, commercial assistant engineer, has resigned, and applications are being invited for the vacancy at a salary of £490 per annum. Mr. Howell has been appointed sales organiser to Domestic Electrification, Ltd. Before going to Battersea, he was for many years with the County of London Electric Supply Co., Ltd., the Falkirk Iron Co., Ltd., and the Hotpoint Electric Appliance Co., Ltd.

Mr. H. B. SHARP, for eleven years rolling stock superintendent with the Rotherham Corporation, has been appointed transport manager of the Borough of Morecambe and Heysham Tramways. Mr. Sharp was previously on the staff of the Bradford Corporation Tramways Department.

The Times states that Mr. THOMAS MENSFORTH, who has recently been employed as works manager at the Darlington Rolling Mills Company, has been appointed electrical engineer of Dorman, Long & Co., as from May 1st.

Obituary.—Mr. O. J. COOPER.—The death occurred on April 17th, at the age of 70 years, of Mr. Occola James Cooper, partner in the firm of Shiner & Cooper, electrical engineers, Winchester. He had been in business in the city for over 40 years.

ALDERMAN F. E. READ.—The death occurred at Stafford recently of Alderman F. E. Read, for many years in charge of the welfare work at the Stafford (Siemens) works of the English Electric Co., Ltd. Alderman Read was born at Lowestoft in 1865; he entered the Siemens works, Woolwich, soon after leaving school, and served as one of the crew of the Cable Ship *Faraday*. When Messrs. Siemens transferred their electrical engineering works from Woolwich to Stafford in 1909, Mr. Read went with other employés and was subsequently appointed Welfare Master. He was a member of the Staffordshire County Council and he had served on the Town Council continuously for 21 years. For his services in connection with local food production during the war period he was awarded the O.B.E. He leaves a widow, three sons and four daughters. The funeral took place at St. Mary's, Castlechurch, Stafford, on Saturday last.

Mr. A. BROWN.—Mr. Alan Brown, who held a position with the Standard Telephone and Cables, Ltd., was killed whilst motoring from Southampton to London on April 22nd. His car was found overturned between Esher and Cobham, and deceased dead beneath it. He was 37 years of age.

Will.—The late Mr. ARTHUR GREENHOW LUPTON, chairman of the Yorkshire Electric Power Co., and principal of a Yorkshire woollen manufacturing firm, left estate valued at £83,010 (net personalty £81,906).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Luton Broadcast Relay Service, Ltd.—Private company. Registered April 16th. Capital, £5,000 in £1 shares (2,500 15 per cent. participating preference and 2,500 ordinary). Objects: To construct and maintain wireless signal and other stations, and to carry on the business of consulting wireless experts, &c. The permanent directors are: N. Powell, address not stated; J. M. Thomas, 17, Loveday Road, W. Ealing, W.13, engineer. Registered office: 8, Queen Square, Luton.

Air Ducts, Ltd.—Private company. Registered April 19th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in heating, ventilating, and electrical plant and apparatus, heating and ventilating engineers and contractors, electricians, &c. The directors are:—J. Fabian, 6, Daleham Gardens, Hampstead, N.W.3, C.A.; W. A. E. Taylor, 5, Hamlet Gardens, W.6, engineer. Registered office: 195, Stamford Brook Arches, Hammersmith, W.6.

Mamco, Ltd.—Private company. Registered April 19th. Capital, £100 in £1 shares. Objects: To carry on the business of agents for the purchase or sale of British, Colonial, or foreign goods of all kinds; manufacturers of, and wholesale and retail dealers in electrical goods, wireless apparatus, hardware, &c. The directors are:—W. B. Heskins, 26, Carlton Road, Walthamstow, E.17; Christabel Meikle, 120, Devonshire Road, Holloway, N.7.

Claude-General Neon Lights, Ltd.—Registered as a private company April 19th. Capital, £218,000 in 200,000 7 per cent. cumulative preference shares of £1 each and 300,000 ordinary and 60,000 founders' shares of 1s. each. Objects: To adopt an agreement with Georges Claude, A. G. für Elektricitäts Industrie and the General Electric Co., Ltd., and to carry on the business of manufacturers of and dealers in illuminated signs, lamps, tubes, and other apparatus for electric or other lighting; electricians, mechanical engineers, advertisement contractors and hirers of illuminescent and other signs, &c. The provisional directors are: J. S. Mellor and E. J. White, Kennan's House, Crown Court, Cheapside, E.C.2, solicitors. Solicitors: Wild Collins & Crosse, Kennan's House, Crown Court, E.C.2.

Booth Bros., Ltd.—Private company. Registered April 22nd. Capital, £2,500 in £1 shares. Objects: To acquire the business of electrical engineers and contractors and general merchants carried on by C. T. Booth and R. C. Booth, at Middlesbrough, and Stockton as "Booth Bros.," and to carry on the business of wireless, lighting, telephone, and general engineers, manufacturers of and dealers in radio apparatus, &c. The first directors are: C. T. Booth, 85, Southfield Road, Middlesbrough, electrical engineer; R. C. Booth, 1, Croydon Road, Middlesbrough, wireless engineer (both permanent). Solicitor: H. Outhwaite, Middlesbrough.

Musikon, Ltd.—Private company. Registered April 25th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with Dayzite, Ltd., and to carry on the business of manufacturers of and dealers in apparatus for the recording and reproduction of sound in synchronisation with kinematograph films, manufacturers of and dealers in bioscopes, gramophones, loud-speakers, microphones, records, electric lamps, high-pressure protective apparatus, &c. The subscribers are: W. E. L. Day, kinematograph expert; H. L. V. Day, electrical engineer; and E. H. Day, electrical engineer, all of 17, Lisle Street, W.C.2. Solicitors: Bulcraig & Davis, Amberley House, Norfolk Street, W.C.2.

Official Returns of Electrical Companies.

Victoria Falls & Transvaal Power Co., Ltd.—Charge on the whole of the assets of the undertaking of the company dated February 14th, 1930, to secure £77,500 and further advances not exceeding therewith £100,000. Holders: A. E. Hadley and R. E. Shott, 2, London Wall Buildings, E.C.2, as trustees for the Staff Benefits Fund. Also trust deed dated September 20th, 1907, and two supplemental trust deeds dated February 10th, 1910, and July 27th, 1911, on which £1,047,550 (£267,670 series "A" debentures, £341,310 series "B" and £438,570 series "C") was outstanding on November 1st, 1929. (Now registered pursuant to Section 91 of the Companies Act, 1929.) Property charged: Mortgage bond on 500,000 shares of Rand Mines Power Supply Co., Ltd., bonds and effective securities executed by that company and the company's undertaking and property, present and future, including uncalled capital. Trustees: M. Luebeck, Salisbury House, E.C., and C. S. Paulet, M.V.O., 16, Gloucester Place, W. Also trust deed dated May 2nd, 1912, constituting a second charge on 500,000 shares in the Rand Mines Power Supply Co., Ltd., and a mortgage bond executed by that company and the company's undertaking and property, present and future, including uncalled capital, on which £737,180 (£436,750 series "A" and 290,420 series "B" mortgage debentures) was outstanding on November 1st, 1929. (Now registered pursuant to the above Section.) Trustees: R. G. Hamilton-Baillie, 10, Hughenden Road, Clifton, Bristol, and C. D. Hely-Hutchinson, 182, Ashley Gardens, W.

Eastern Wireless Co., Ltd.—Capital, £500 in £1 shares. Return dated October 16th, 1929 (filed January 27th, 1930). All shares taken up. £500 paid. Mortgages and charges, nil.

Santon, Ltd.—Capital, £4,000 in £1 shares. Return dated January 11th, 1930. 2,000 shares taken up. £2 paid. £1,998 considered as paid. Mortgages and charges, £3,200.

Burt, Escare & Denelle, Ltd.—Capital, £40,000 in 15,000 preference and 25,000 ordinary shares of £1 each. Return dated December 10th, 1929. 15,000 preference and 22,732 ordinary shares taken up. £37,732 paid. Mortgages and charges, £5,000.

Tungstone Accumulator Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 19th, 1929 (filed March 13th, 1930). 500 shares taken up. £500 paid. Mortgages and charges, nil.

Tel-a-lite and Accessories, Ltd.—Capital, £500 in £1 shares. Return dated January 31st, 1930. 352 shares taken up. £319 paid. £33 considered as paid. Mortgages and charges, nil.

Anchor Cable Co., Ltd.—Capital, £250,000 in £10 shares. Return dated May 23rd, 1929 (filed January 3rd, 1930). 19,500 shares taken up. £61,000 paid. £134,000 considered as paid. Mortgages and charges, £50,000.

J. V. Brittain & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 2nd, 1930. All shares taken up. £1,000 paid. Mortgages and charges, nil.

British Electrical Instruments, Ltd.—J. W. Shepherd, 78, King Street, Manchester, was appointed receiver on April 4th, 1930, under powers contained in debenture dated August 30th, 1929.

Voltron Co., Ltd.—F. T. Smith, Premier House, Southampton Row, W.C.1, was appointed receiver and manager on April 3rd, 1930, under powers contained in debenture dated March 14th, 1929, and second debenture dated March 26th, 1930.

Accurate Recording Instrument Co., Ltd.—Particulars filed of £3,000 debentures authorised April 4th, 1930, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Allite, Ltd.—J. W. Rochester, 5, Dysart Street, E.C.2, was appointed receiver on March 25th, 1930, under powers contained in debentures dated March 15th, 1929.

W. J. Henderson & Co., Ltd.—A. C. Lucas, 167, Strand, W.C.2, was appointed receiver and manager on April 7th, 1930, under powers contained in debenture dated November 12th, 1929.

Lockett, Lloyd & Statham, Ltd.—Capital, £2,000 in £1 shares. Return dated February 22nd, 1930. 1,500 shares taken up. £1,500 paid. Mortgages and charges, nil.

Second Electric Supply Corporation, Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1929. Seven shares taken up. Nil called up. Mortgages and charges, nil.

Ernest Jones & Co., Ltd.—Capital, £500 in £1 shares. Return dated December 21st, 1929. 112 shares taken up. £112 paid. Mortgages and charges, nil.

Ernest F. Moy, Ltd.—Capital, £10,000 in 1,500 preference and 8,500 ordinary shares of £1. Return dated October 10th, 1929 (filed March 12th, 1930). All shares taken up. £10,000 paid. Mortgages and charges, £6,000.

Wellington District Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 24th, 1929. All shares taken up. 4s. per share called up. £1,000 paid. Mortgages and charges, nil.

Nivalight (1928), Ltd.—Capital £5,000 in £1 shares. Return dated December 31st, 1929. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Polo Battery Manufacturing Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1929. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Exe Valley Electricity Co., Ltd.—Satisfaction in full on March 6th, 1930, of debenture in favour of Branch Nominees, Ltd, dated August 29th, 1927, and registered September 2nd, 1927. (According to the register of mortgages, the debenture registered September 2nd, 1927, originally secured £1,000).

Electric Construction Co., Ltd.—Satisfaction to the further extent of £2,150 on March 31st, 1930, of 4 per cent. perpetual first mortgage debenture stock secured by trust deed dated December 16th, 1897, and registered September 10th, 1908, securing £200,000.

Richmore Valve Co., Ltd.—C. H. Shelvoke, 33, Newhall Street, Birmingham, ceased to act as receiver and/or manager on April 9th, 1930.

City Notes.

Johnson & Phillips, Ltd.

The trading account for the year ended December 31st last shows that after providing for bad debts and charging £16,000 upwards for maintenance, there was a profit of £158,191, as compared with £106,417 for 1928. The net profit, after meeting debenture interest, depreciation, &c., is £102,514 (against £58,831), and to this is added £80,903 brought forward, making available £183,417. The final ordinary dividend is 5 per cent., again making 10 per cent. for the year, and £123,417 is to be carried forward. The report states that the result of the year's trading is considered satisfactory, as the profits earned are nearly £50,000 above those of the previous year. This substantial improvement is due partly to an increase in turnover, but principally to the great economies effected in production costs. Important contracts have been secured during the last few months, and the prospects for the current year are favourable. Two subsidiary companies were in operation during part of the year only, and, as was to be anticipated, losses were incurred (totalling £2,677) in the initial stages of these undertakings. Meeting: May 5th.

John Thompson, Ltd.

The annual meetings of the associated companies, which include John Thompson (Wolverhampton), Ltd., John Thompson Water Tube Boilers, Ltd., and the Kennicott Water Softener Co., Ltd., were held on April 15th and 16th. The chairman in his speech said that the year's trading showed a record turnover, and the carry-forward had been increased by a substantial sum. The number of employés now exceeded 3,000 and important extensions had been carried out from which it was hoped further expansion of the companies' interests would accrue. Important boiler contracts had been secured in the current year for Glasgow, Manchester, and Bath Corporations, and the London Power Co. The associated company, John Thompson (Australia) Pty., Ltd., Melbourne, was well forward with the large contracts which it had in hand for that country, and the new undertaking, John Thompson Combustion Engineering Pty., Ltd., had started operations at its works in the State of Victoria to develop the companies' manufactures in Australia, the works now being in commission with prospects of early extensions. The report and accounts were adopted.

International Paper and Power Co.

The first annual report of this company shows that for 1929 the earnings available for depreciation and for dividends amounted to $13,151,265. The total dividend payments on the shares of the company amounted to $8,834,511 (preferred dividends $6,447,651, and Class "A" common dividends $2,386,800), and depreciation to $9,139,503, leaving a deficit for the year of $4,822,749.

The organisation of the International Paper & Power Co. and of the International Hydro-Electric System, the power and utility holding company for the group, has made it possible to broaden substantially the scope of the company's operations in the utility field. Specifically, it has made possible the acquisition of a controlling interest in the New England Power Association. The broadened scope of power and utility operations is indicated by the fact that out of total capital assets with a book value of $661,001,400 at December 31st, 1929, $410,610,283, or over 62 per cent., represented power and utility properties and investments. At the present time practically two-thirds of the consolidated net earnings available for interest and reserves are being derived from power and utility operations.

Cork Electric Supply Co., Ltd.

In a circular to the shareholders, the company states that owing to the acquisition of the lighting undertakings in Cork and Cobh by the Electricity Supply Board under the compulsory powers of the Electricity (Supply), Act, 1927, it has become necessary to decide the relative rights of the preference and ordinary shareholders in the event of a capitalisation of the surplus assets, or on the ultimate winding up or liquidation of the company. The directors are advised that it will be necessary to institute proceedings in the Free State High Court to decide the legal questions involved, and for this purpose it will be necessary to appoint representatives of the various classes of shareholders in order that their interests may be fully protected. The price to be paid by the Electricity Supply Board for the company's undertakings is £496,500. The tramways will continue to be operated by the company.

Hopkinson's, Ltd.

Presiding at the annual meeting on April 25th, Mr. R. A. Hopkinson (chairman and managing director) said that although almost every branch of their home customers was suffering from the general trade depression, to a large extent the decline in the home trade had been compensated for by an increase in overseas orders, which now represented about 40 per cent. of their turnover. Expenditure on buildings and plant during the 47 months' existence of the company amounted to £114,000. The programme for extensions having been completed, they were now in a position to provide accommodation and equipment for any new manufactures which they might decide to enter upon. The report and accounts were adopted.

Pye Radio, Ltd.

The first report for the year ended March 31st last shows that after providing for depreciation, &c., there is a profit of £62,686, to which is added £2,788 earned in the period February 12th to March 31st, 1929. The 8 per cent. participating preferred ordinary shares are to receive the maximum dividend of 10 per cent., less tax, while the deferred ordinary capital receives 100 per cent., less tax, leaving £12,022 to be carried forward. The report states that the capital expenditure on the works at Cambridge is now practically completed. The full equipment of the new buildings, it is expected, will be completed within the next three months, and will be in full operation before the commencement of the ensuing radio season.

Northern General Transport Co., Ltd.

The total revenue for the year ended December 31st last was £532,248, and the working surplus was £134,899, to which is added £10,252 brought forward, making £145,151. After deducting administration and general expenses, debenture interest, &c., and providing for renewals, there is a balance of £55,283. A dividend at the rate of 7½ per cent. per annum is recommended on the ordinary shares, leaving £4,244 to be carried forward. During the year the capital was increased to £800 000 by the creation of 100,000 ordinary shares of £1 each, and an issue was made of 110,303 ordinary shares of £1 each at par.

Jarrow & District Electric Traction Co., Ltd.

The revenue for 1929 amounted to £3,747, and the expenses, including debenture interest, to £4,829, the result being a loss of £1,082. After deducting the balance of £427 brought forward from the previous year, there remains a deficit of £655, which has been written off reserve. In the 1928-29 session of Parliament powers were secured to abandon the light railways, but the company failed to obtain exclusive powers to operate omnibus services over the light railway route. On June 30th last the tramcar services were discontinued and the light railways abandoned.

Gateshead & District Tramways Co.

The revenue for 1929 increased by £2,594 to £123,999, and the net profit by £7,227 to £25,516. A balance of £18,895 brought forward is added, making £44,411. The dividend on the ordinary shares is raised from 6 to 8 per cent. (10 per cent. for 1927), and £20,309 is carried forward. The report states that the reconstruction of the road bridge on the Dunstan route was completed in April last year; it also reports the death of two directors—Judge Atherley Jones, K.C., and Mr. C. R. Greene. It is proposed that Messrs. T. Hornsby and W. M. Seasdale shall be appointed to the board.

Potteries Electric Traction Co., Ltd.

The report for 1929 shows a total revenue of £339,865 and operating expenses of £257,433, leaving a gross surplus of £82,432, to which is added £4,962 brought forward, making £87,413. After deducting debenture interest, &c., and providing for renewals, there is a balance to be carried forward of £5,413. The removal of the whole of the overhead equipment, cables and tramway track has been completed, and the tramcar sheds at Stoke, Goldenhill, and Fenton have been converted into garages.

City Electric Light Co., Ltd. (Brisbane).

The report for the year ended January 31st last shows a credit balance of £128,298, which, with a balance brought forward, makes £128,337 available. An interim dividend was paid in September last, amounting to £63,099, and a further dividend of 5 per cent. is recommended on the ordinary shares, in proportion to the amount paid thereon, free of State tax, leaving £40 to be carried forward. Mr. F. A. J. Isles has resigned from the board and Mr. J. T. Isles has been elected to fill the vacancy.

Cable, Telephone & General Trust.

The directors propose to increase the authorised capital from £710,000 to £1,100,000 by the creation of 390,000 £1 shares of which 250,000 will be preference, 5,000 "A" preference, and 135,000 ordinary. It is also proposed to increase the rate of annual dividend on the preference shares from 6 per cent. cumulative to 7 per cent., cumulative as from June 30th next, and to rename the "A" preference shares "preferred ordinary shares."

South Wales Electrical Power Distribution Co.

The report for the year ended December 31st last shows that after deducting working expenses, debenture interest, &c., there is a balance of £29,597. It is proposed to place £15,000 to depreciation reserve, to pay the preference dividend, and to pay over the remainder (£8,331) to the South Wales Power Co., Ltd. Meeting: May 9th.

South Wales Power Co., Ltd.

The revenue for 1929, including a balance from the South Wales Electrical Power Distribution Co.'s revenue account, was £60,731, to which is added £21,182 brought forward, making £81,913. After deducting debenture interest, paying the preference dividend, &c., there is a balance of £24,354, which it is proposed to carry forward. Meeting: May 9th.

Urban Electric Supply Co., Ltd.

The report for 1929 shows a net profit of £102,224, to which is added £22,953 brought forward, making £125,177. It is proposed to place £30,000 to reserve for depreciation, £15,000 to general reserve, contribute £2,000 to the staff benevolent fund, and to pay a final dividend on the ordinary shares of 4 per cent., making 7 per cent. for the year (as for 1928), leaving £26,029 to be carried forward. Meeting: May 8th.

Rangoon Electric Tramway & Supply Co., Ltd.

The net profit for 1929 was £62,828, as against £58,058 in 1928. It is proposed to pay a final dividend on the ordinary shares of 1 rupee 4 annas per share, making 1 rupee 12 annas, free of Indian tax, for the year (as for 1928), leaving £21,786 to be carried forward. The number of passengers carried was 27,307,566, and during the year 548 consumers were connected.

Ever-Ready Company (Great Britain), Ltd.

The accounts for the year ended March 31st last show a net profit of £244,754, as compared with £210,167 in the preceding year. The reserves and carry forward total £534,198, as against £500,696. A final dividend of 25 per cent. is recommended on the ordinary shares, making 35 per cent. for the year (the same on increased capital).

West London and Provincial Electric and General Trust, Ltd.

The profit for the past year fell from £29,532 to £27,480. The ordinary dividend is maintained at 10 per cent. (5½ per cent. final), but last year there was also a capital bonus of 20 per cent.

Montreal Light, Heat and Power Consolidated.

The directors announce that the common shares of the company will be split into two for one and that the common stock will now consist of 5,000,000 no-par-value shares. The new issue will be sold to customers and employés at $50 a share, and shareholders will have the privilege of buying one new share for every five old shares held.—*Reuter* (Montreal).

Howard & Bullough, Ltd.

The profit for the year ended March 31st last was £1,610, to which is added £3,093 brought forward and £55,000 transferred from dividend reserve, making £59,703. A dividend of 2½ per cent. is paid on the ordinary shares and £3,453 is carried forward.

Italian Loans Abroad.

It is announced that an issue of $10,000,000 6½ per cent. 30-year bonds is being made in New York on behalf of the Società Idroelettrica Piemonte. In addition to this the company is raising a loan of 25,000,000 fr. in Switzerland.

Western Union Telegraph Co.

The gross revenue for the quarter ended March 31st last was $33,578,027, as against $35,642,794 in 1929. Expenses totalled $31,062,663 ($31,025,918), and there was a net income of $1,486,803 ($3,714,360).

British Power & Light Corporation, Ltd.

This company's first report, covering the period from May 7th, 1929, to March 31st last, shows a total revenue of £29,924 and a balance of £20,536, after meeting expenses and taxes, which has been carried forward. The company was formed last year to acquire controlling interests in a number of electricity supply companies, including the North Wales Power Co. and the Electricity Distribution of North Wales and District. The companies concerned have now been placed under a central management.

Brush Electrical Engineering Co., Ltd.

The directors again recommend the payment of a dividend of 10 per cent. for the past year. The surplus under the co-partnership scheme is £2,787.

Oriental Telephone & Electric Co., Ltd.

The directors recommend a final dividend of 8 per cent., free of tax, on the ordinary shares, making 12 per cent., free of tax, for the year ended December 31st last.

Adelaide Electric Supply Co., Ltd.

An interim dividend has been declared on the ordinary stock in respect of the year ending August 31st of 6 per cent. actual, free of tax.

City of Buenos Ayres Tramways (1904), Ltd.

An interim dividend of 1s. 3d. per share, less tax, has been declared for the three months ended March 31st last.

German Companies.

The *German Cable Works Co.*, Berlin, after having passed the dividend for two years, intends to pay 6 per cent. for 1929 out of net profits of 980,000 marks, against 930,000 marks in 1928. The report states that the turnover of the company and its subsidiaries increased. In the wire and cable branches the decline in the home trade was more than compensated for by larger exports.

The *Land and Marine Cable Works Co.*, Cologne-Nippes, states that business continued to be satisfactory in 1929, the effects of the general unfavourable situation of trade only having become perceptible towards the end of the year. The price level in the home market was inadequate for a part of the production, while the prices obtained for export were lower than the prime costs. But as it was possible to increase the turnover the net profits at 330,000 marks were about the same as in 1928, and the dividend is maintained at 10 per cent.

The *Brown-Boveri Co.*, Mannheim, reports an increase in the turnover in 1929 over that of the previous year, and a correspondingly larger stock of orders was brought over into 1930. There were increased orders for generators and transformers, but the sale of motors suffered from the industrial depression, and the Reich Railways were reserved in placing contracts. The tramway accessory department was extended and greater attention was devoted to domestic apparatus. The net profits amounted to 2,437,000 marks, against 1,963,000 marks in 1928, and the dividend remains at 9 per cent. on a larger capital.

Dutch Companies.

The *Netherlands Cable Works Company* states that the course of business in 1929 gave cause for satisfaction both from the technical and financial points of view. Among the orders executed special mention is made of a three-core cable of a length of about 20 miles at 50,000 volts for the supply system in the north of Holland, and of telephone cable with Pupin coils for long-distance telephony for the State telephone network. The turnover increased and so did the export trade despite the difficulties encountered. The net profit was 2,235,000 fl. as compared with 1,717,000 fl. in the previous year. It is proposed to pay an extra dividend of 19 per cent. besides the statutory rate of 6 per cent., making a total of 25 per cent.

The *Electrical Apparatus Works Co.* (late F. Hazemeyer and Co.), of Hengelo, states that the turnover in 1929 increased by 50 per cent. to a value of 3,000,000 fl. The export trade continued to develop, but frequently did not yield the desired profit. The net profits amounted to 358,000 fl. as compared with 225,000 fl. in 1928, and the dividend remains at 10 per cent.

Swedish Company.

The accounts of *A.B. Elektrolux* show an income of Kr. 10,294,801, while expenses were Kr. 1,674,824, and Kr. 79,998 was written off depreciation of fixtures. The net profit was Kr. 8,539,984, to which is added Kr. 700,969 brought forward, making Kr. 9,240,953. Reserve receives Kr. 1,000,000, and the dividend is again 9 per cent., leaving Kr. 1,565,953 to be carried forward.

French Company.

The *Compagnie Générale d'Electricité* states that the net profits increased from 20,993,000 fr. in 1928 to 27,614,000 fr. last year. The dividend is to be maintained at 85 fr. per share.

Austrian Company.

The *Austrian Brown-Boveri Co.* again proposes to pay 14 per cent. out of net profits of 961,000 schillings for 1929.

Stocks and Shares.

TUESDAY EVENING.

THE effect of money being plentiful is counteracted by the demands which are being made by borrowers seeking fresh capital. Several international loans are on the stocks. The most interesting offer this week came from the State of Sao Paulo, which asked for £8,000,000 from this country. Other substantial sums are known to be required, and there is talk of a heavy Reparations loan to be made in the near future. Gossip flirts with the idea of the Government undertaking a comprehensive scheme of conversion of the five per cent. War Loan. If brought into operation, this would involve no new money being required, but it might introduce a temporary factor of unsettlement so far as the money market is concerned. The net result of such considerations as these is to lay a hand of restraint over Stock Exchange activities. There is not much doing, either, in the speculative departments, and the excitement in connection with American utility shares has given signs of subsiding. A satisfactory feature is the way in which the prices of home electricity shares maintain their recent improvements.

Amongst other forthcoming issues is an offer of new shares, on bonus terms, to holders of Montreal Light, Heat and Power. The existing common shares are to be divided, and the total amount will consist of five million shares of no par value. Preliminary details were given in the ELECTRICAL REVIEW, page 791, last week. The new issue will be sold to customers, employés, and shareholders at $50 per share. The company is also making a reduction in its charges for electricity.

"Money" Stocks.

Amongst the fixed-interest stocks, the Central Electricity Board 5 per cent. scrip is a little easier at 99. North-West Midlands Joint Electricity fives are unchanged at 98¼, not 99¼ as mentioned here last week. The North Metropolitan 5½ per cent. debenture stock, which rose to 5½ premium, is but 5s. below the best. West Gloucestershire Power 5½ per cent. debenture stock remains on offer at 97½ free of stamp and fee. At this price, the yield on the money is £5 12s. 9d. per cent. Interest payments are due in the middle of January and July. About £10,000 stock can be obtained of the West Midlands Joint Electricity Authority 5 per cent. issue, 1948-68, at 99¼, free of stamp, this giving a return of a shade over 5 per cent. on the money. Interest is due on the 1st of April and October, and the stock is redeemable at 100 in or after 1948. The Southern Railway Company's 5 per cent. new preference stock has gone back to a ¼ discount owing to the competition of other newcomers.

Home Electricity Supply.

The speech of Sir Harry Renwick, read at the meeting of the County of London Company, had the effect of bringing about a rise of 2s. in the price of the company's ordinary shares, lifting the latter to 48s. 9d. ex dividend. A rise of 1s. in Midland Counties took the price to 30s., the shares coming into mild demand on a statement that they are to be introduced into the New York Stock Exchange "Kerb" market during the present week. Such introduction is regarded as a bull point, in that it widens the circle of demand. This may act, also, boomerang fashion, as will be remembered, for example, by those who bought G.E.C. shares on the keen interest that was being taken in the company by American operators. The latter, however, turned out the shares in wholesale manner at the time of the New York Stock Exchange débâcle last autumn. Since then, there has been, of course, a recovery in G.E.C. shares, which now stand at 47s. 6d.

Reverting to electricity supply shares, improvements of 1/16 have taken place in Brompton ordinary, and in Chelsea ordinary, the prices of both of which are ex dividend. Absorption of stock in this market is due to the growing anticipation that the London companies will not necessarily limit their dividends to 7 per cent. in 1931, but that they will be, at that time, in a position that will enable them to take advantage of the provision whereby, in giving certain concessions to their customers, they can increase their dividends above the statutory rate of 7 per cent. Urban Electric Supply shares are unchanged at 38s. 9d., the report announcing a dividend of 7 per cent. for the year, the same as that of twelve months ago. The auditors' report is presented subject to reserve for depreciation being sufficient. The company's net profit for last year of £102,000 is about £1,400 more on the year. It had been hoped in the market that the company would be able to present rather better figures. Scottish Power new shares keep hard at 1s. premium. Isle of Thanet preference strengthened to 23s. 9d.

Cables and Wireless.

Cables and Wireless stocks remain weak. Fresh falls have occurred in the three classes of the merger issues, and, although an occasional resistance is offered to the depression, it would appear as though every recovery meets with fresh realisation of stock. It is obvious that the confidence of stockholders is badly shaken, and the tenderness of the market, to use a Stock Exchange phrase, is in itself sufficient to keep alive the nervousness felt for some time past in connection with the position of the two ordinary stocks. In the Transatlantic group, Anglo-American deferred strengthened to 25, and

amongst the wireless shares, Marconi Marines reverted to 2 1/16, after being 1/16 higher. Globe Telegraphs continue dull at 21½: Automatic Telephones show no change at 37s. 6d. Great Northerns have shed 10s., falling back to 32. American Telephone and Telegraph at 255 is 5 points down; International Telephone and Telegraph is 1 better, at 74½.

Home Railway Stocks.

Metropolitan consolidated stock has risen to 66½, which is about the only improvement in Home Rails during the past week. Underground incomes went back 2 to 110, after the rise which occurred by reason of there being no fresh Budget-tax imposed upon petrol. The majority of stocks in the prior-charge group have drooped, the falls being mostly a point apiece. This is because of the talk of money becoming dearer instead of cheaper, in addition to which there is the competition from the new issues to which reference has already been made. A rise of 75 points in British Electric Traction deferred ordinary stock lifted the price to 1750, there being some little inquiry by reason of the process of linking-up which takes place continuously between the railways and omnibus companies.

Tramway issues are very quiet. There is a dull disposition amongst Indian shares in consequence of the gravity of the political situation. The Madras Electric Tramways, 1904, made a gross profit last year of £25,900, which is about £3,000 less than that earned in the previous year. The dividend on the preference shares is being paid, but the ordinary again go without distribution. Calcutta Electric Supply at 48s. are 1s. 6d. down, notwithstanding the increase of 1d. per share in the bonus recently declared by the company.

Dollar and Foreign Stocks.

Brazilian Tractions have been a lively spot, active New York support taking the price to 53½ before the market reacted to 51½. Hydro-Electrics have dropped 4½ to 48¾. International Holdings at 6⅝ are 1⅛ down. Montreal Light and Power at 139½ shows a fall of 2¾ points. Power Corporation of Canada have gone back 6 to 84½. Shawinigan Water shares at 80 are also easier. Pennsylvania Water and Power is down 1½ at 88½. Calgary Power dropped, in one day, no less than 45, to 160. Yet the company's first mortgage bonds rose, on the same day, 4 points to 101½. British Columbia "A" and "B" are flat at 42 and 22, respectively.

The Mexican group keeps tolerably steady; the only change is a nominal fall to 76½ in Mexican Light and Power preferred, explained by deduction of the dividend from the price last week. The Anglo-Argentine Tramways stocks are inclined to be heavy, though no quotable alterations have occurred. At the meeting of the La Guaira and Caracas Railway Company, the chairman mentioned that running expenses had been considerably reduced, mainly, if not entirely, as a result of the electrification of the line. When this plan was first proposed, it met with expert opposition, but the directors can fairly claim that their policy has been justified by events.

The Manufacturing Group.

The Brush Electrical Engineering Company announces a dividend of 10 per cent. for the year, which is no change, and the price remains at 127½. The company pays its dividend once a year on the ordinary stock. Most people like to receive their dividends bi-annually, and possibly the directors may see their way to make some alteration in the present arrangement. Johnson & Phillips are again paying 10 per cent., and the profit of £155,000 is nearly £50,000 better than that earned in 1928. The carry-forward is raised to £123,400, an increase of nearly £43,000 as compared with the previous period. Important contracts have been secured during the past three months. The maintenance of the dividend at 10 per cent. caused a slight disappointment. Intelligent anticipation of a good year, such as the accounts now reflect, had been accompanied by the hope of an increased payment to the shareholders. Therefore, while the nominal price of the shares is unchanged at £2, actually the market is a little easier than it was. There has been animated business on the basis of 38s. 6d. British Electric Transformer preference have fallen to 8s. 9d. Callender's "B" preference are a trifle lower at 27s. Associated Electric Industries ordinary at 28s. are unchanged, after being up to 29s. 3d. Other prices in the list exhibit no changes worth mentioning.

Miscellaneous Matters.

British Light & Power shares have weakened to 14s. upon the issue of a report that fell below previous anticipation of its probable contents. An interesting annual report, published this week, is that of the company generally known as the Sofina. The undertaking holds a position of importance and of responsibility in a number of countries, including our own, where the development of electrical enterprise is being vigorously advanced. The Sofina Company made a profit, for last year, of £667,000 and declared dividends amounting to 700 fr. per share. In the London market, fractions of the shares are dealt in, and are called "Sofinettes"; the present price is 58s. 9d.

Babcock & Wilcox have gone back to 3, on the reduced profits shown in the accounts recently published. Vickers and similar shares are dull. Rubber shares have taken on a heavy aspect by reason of a further fall in the price of rubber.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1928.	1929.	Price April 29 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	8½	—	4 16 0
Brompton Ordinary	1	8½	8½	26/6xd	+⅛	5 5 8
Charing Cross Ordinary ...	1	8½	8½	27/6	—	5 1 10
do. do. 4½% Pref. ...	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8⅝	8⅝	26/6xd	+⅛	5 5 8
City of London	1	10	10	33/3	—	4 4 6
do. do. 6% Pref....	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	27/-	—	4 6 6
County of London	1	7	10	46/9xd	+2/-	4 2 0
do. do. 6% Pref....	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref. ...	1	7	7	24/-	—	5 16 8
Elec. Supply Corporation ...	1	11	11	47/-	—	4 13 7
Kensington Ordinary ...	1	8	8	26/-	—	5 7 8
Lancs. Light and Power ...	1	7½	7½	27/-	—	5 11 1
London Electric	1	8½	9	29/6	−6d.	4 15 0
Metropolitan	1	9	10	41/3	—	4 17 0
do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	7	30/-	+1/-	4 13 4
Mid. Elec. Power	1	15	8	32/-	+9d.	5 0 0
Newcastle-on-Tyne Ordinary ...	1	6	6	24/6	—	4 18 0
do. 7% Pref. ...	1	7	7	25/6	—	5 9 10
Notting Hill 6% Pref. ...	10	6	6	10⅞	—	5 11 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6xd	+6d.	5 6 8
St. James' and Pall Mall ...	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	29/-	—	5 3 3
South London	1	8½	8½	27/6	—	5 1 10
Urban Ordinary	1	7	7	33/9	—	4 2 10
Westminster Ordinary ...	1	8½	8½	26/6	—	5 5 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	21/6	—	5 2 5
Yorkshire Elec.	1	8	8	33/9	—	4 14 6

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	77	—	5 4 0
Metropolitan	„	3½	4	66½	+1	6 0 2
do. District ... —	„	4	5	77½	—	6 9 0
Underground Electric ...	£1	7	8	23/6	—	£ 16 2
do. do. Income ...	Bonds	6	6	110	−2	5 9 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	102½xd	—	5 17 0
do. Def.	„	1½	1½	25	+⅛	6 0 0
Automatic Telephone	1	10	15½	87/6	—	6 13 4
Cables & Wireless 5½ Pref. ...	Stock	—	5½	94½	−2	5 16 5
do. A 7½ Ord.	„	—	—	52½	−4	... —
do. B Ord.	„	—	—	27½	−1½	... —
Globe Tel. and T. Ord. ...	10	10	10	21½	—	*4 13 0
do. do. Pref.	10	6	6	11⅛	—	5 9 1
Great Northern Tel.	10	20	20	32	−½	6 5 0
Marconi-Marine	1	12½	15	2⅛	—	7 5 8
Oriental Telephone Ord	1	12	12	55/6	—	*4 6 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8	—	3 3 4
do. do. 2nd Pref. ...	5	6	6	8⅞	—	3 16 0
do. do. 5% Deb. ...	Stock	5	5	71½	—	7 0 0
British Electric Traction Def. Ord.	„	5	5	1750	+75	... —
do. do. Pref. Ord.	„	8	8	126½	—	6 6 6
Brazil Traction	100	7	8	51½	−2	3 17 9
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	98½	+1	5 7 —
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	—	... —
London United Tram Deb. ...	Stock	4	4	52½	—	† 13 4
Mexico Trams, 5% Bonds	—	5	5	70	—	† 2 10
Mexican Light Common	100	Nil	Nil	86½	—	... —
do. 7% Pref.	100	7	7	76½xd	—	9 3 0
do. 1st Bonds	—	5	5	79	+2	6 6 7
Victoria Falls Ord.	1	15	15	23/6	+6d.	4 15 10
Yorkshire (West Riding)		Nil	Nil	5/-	—	... —

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	6	28/-	—	4 5 9
Babcock & Wilcox	1	12	15	3	−½	*5 0 0
British Aluminium Ord.	1	10	10	46/3	—	4 7 2
British Elec. Transformer Pref. ...	1	7	7	8/9	−⅛	... —
British Insulated Ord.	1	15	15	115	—	† 17 6
Brush Ord.	Stock	10	10	127½	—	† 17 0
Callenders	1	15	15	82	—	4 0 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 8
Crompton Parkinson Ord.	£/-	—	80	92/6	—	6 12 4
do. 8% Pref.	1	8	8	24/6	—	6 10 9
Edison-Swan 1st Pref.	1	7½	7½	26/6	—	† 1 3
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	11/3	—	9 14 6
Enfield Cable Ord.	1	20	20	44	—	4 9 0
English Electric	1	Nil	Nil	3/9	—	... —
do. do. Pref.	1	3	Nil	7/6	—	... —
Gen. Elec. Pref.	1	6½	6½	23/6	—	† 10 7
do. Ord.	1	10	10	4-/6	—	4 6 8
Henley...	1	25	20	6⅜	—	† 10 5
do. 4½% Pref.	5	4½	4½	42	—	5 6 0
India-Rubber	1	Nil	Nil	10/9	—	... —
Johnson & Phillips	1	10	10	2	—	5 0 0
Siemens Ord.	1	7½	7½	25/-	—	6 0 0
Telegraph Construction	12	10	10	22½	—	*5 6 8

* Dividends paid free of Income Tax.

Conditions in South Africa.

Trade Commissioners' Review.

THE Department of Overseas Trade has issued (through the Stationery Office, 2s. net) a report by Mr. N. Elmslie, Senior Trade Commissioner in South Africa, assisted by Mr. J. W. Brigden, Trade Commissioner at Johannesburg, upon economic conditions in the Union during 1929. The present position, according to the report, is a satisfactory one, the country having continued to make progress in all directions. It is felt, however, that Government expenditure is on too large a scale; while the commitments can be borne easily in prosperous times serious difficulties may arise in a subsequent period of depression. The railways have continued to prosper, but are threatened with serious competition from road transport. The productive industries are all in a very healthy position, but the expansion of the export trade has not kept pace with the general development. On the other hand, the import trade has continued to expand. It was considered probable that the favourable balance of trade which was over £11,000,000 in 1928 might fall to £5,000,000 last year, an amount insufficient to balance the Union's accounts. There are also other indications of the approach of a period of financial stringency. Mr. Elmslie says although the value of goods imported from the United Kingdom increased in 1928, the proportion of the imports from this country fell from 44.8 to 43.5 per cent. In his opinion this proportion is lower than it would be if manufacturers and exporters in the United Kingdom devoted more attention to the market and adopted more efficient methods of advertising, selling, and "servicing" their products.

The Electrical Import Trade.

The imports, in 1928, of electrical plant, machinery, fittings and materials (excluding lamps, telegraph, telephone, and radio goods), showed a further small advance in value to £2,180,851, but the proportion contributed by the United Kingdom declined to rather under 69 per cent., while the contributions of a number of other countries increased. Germany's share of the trade rose from £158,803 to £203,033. As regards the items separately recorded, the position of the United Kingdom improved in primary and secondary batteries both in the value of business obtained and in the proportion of the whole. The trade in dynamos and generators was satisfactory, but the value of imports of motors was considerably smaller, and a larger proportion was obtained from foreign sources, particularly from Germany. In transformers imports were larger and the proportion of the United Kingdom improved to 68 per cent.; imports from Germany increased, while those from the United States were considerably smaller. Imports of cables and wires were smaller in quantity and value than in the three previous years and the share of the United Kingdom in the trade fell to under 90 per cent. for the first time for many years. Imports from Germany, Belgium, and the United States were all greater. Imports of heating and cooking apparatus have been increasing for some years, and in 1928 the value increased by nearly 50 per cent. to £118,358. Imports from the United Kingdom showed but little sign of improvement, and in 1928, for the first time, Canada took first place as supplier with £44,231 or 37.3 per cent. The United States and Germany are also improving their trade although at a slower rate. Electric lamps, which are not included in the total figures given above, were imported to a value of £131,810. Suppliers in the United Kingdom are slowly losing trade to Holland and Germany.

The value of imports of radio apparatus showed a substantial improvement in 1928 for the first time since the heavy importation in 1924, although the year's total, £83,762, was still only little more than one-third of the 1924 total. Imports from the United States, Germany, Norway, and other countries increased considerably, and the United Kingdom's proportion of the trade consequently fell. Trade is considered likely to improve.

Imports of telegraph and telephone material were higher than in 1927, at £108,731, of which the United Kingdom supplied £65,005, Sweden £23,431, and Germany £11,145.

Supplies for the Mining Industry.

In an appendix it is shown that the purchases of the South African mining industry during the year included electrical machinery valued at £486,251 (against £662,973 in 1927), the bulk of it being imported. The purchases of electrical spares and fittings had a total value of £165,617 in 1928, as compared with £175,431 in 1927.

Mr. Brigden says with regard to the supply of material, equipment, and stores generally to the mining industry, that foreign competition is making considerable progress, and the methods adopted by the competitive firms are indicative of the need for more active efforts and closer knowledge of the requirements of the market by manufacturers in the United Kingdom. It is only by devoting close attention to the requirements of the market that the manufacturer can become aware of the type and quality of goods demanded; and having produced goods of the required standard, it is essential that he should take adequate steps to advertise that fact to the market. The market for goods from the United Kingdom in this area is one which can be expanded; there is a sentimental preference for goods from the United Kingdom which confers an initial advantage, but the goods themselves must be of the type and quality wanted, and must be pushed with vigour and skill as great as is exercised by foreign competitors. The closest co-operation between the manufacturer and the representative on the spot is a factor of considerable importance.

Openings in Brazil.

The Republic's Continued Progress.

THE Department of Overseas Trade has issued a report by Mr. S. G. Irving, Commercial Secretary at Rio de Janeiro, on economic conditions in Brazil, dated November, 1929 (Stationery Office, 2s. 6d. net). The report is prefaced with some useful hints to travellers which convey an idea of general conditions and prices in the great Republic. In a general survey the author points out that the development of Brazil since the establishment of the Republic has been so rapid that a continually expanding prosperity has come to be regarded as a matter of course. In spite of "crises" the development has gone on; thus, although during the past year or so business in the capital and the principal cities has been conducted in an atmosphere of depression and pessimism, the imports of motor cars in the first half of 1929 showed an increase of 98 per cent. as compared with the first half of the preceding year.

An indication of the progress which is being made is afforded by the record of the Brazilian Traction Co., whose activities are greater than ever and continually increasing. Rapid progress is being made with this company's power stations at Cubatao between Sao Paulo and Santos, which, when completed, will increase the reserve capacity of the system to more than 30 times that of 1925. The new power station, at present intended to provide 96,000 h.p., will be capable of producing over 500,000 h.p. as the demand increases. The same company is also installing automatic telephones in Rio de Janeiro and Sao Paulo. Meanwhile the tram, telephone and lighting services of several other less important cities have been taken in hand by an American group, and will undoubtedly be much improved in the next few years. There is more than a possibility that within a year or two the construction will be undertaken of a new electric broad gauge double railway from Sao Paulo to Santos, having six times the capacity of the existing line, and the Santos Docks Co. has already prepared plans for largely increasing the accommodation of the port. These and other activities show that a continuance, or even an acceleration, of progress can safely be predicted. There is, however, some anxiety with regard to the continued falling off in the export surplus. This is attributable mainly to the coffee defence scheme by which large stocks were kept in the country to prevent the collapse of the world price for it. Cheaper money and an extension of credit are said to be two urgent needs of the country.

Import Trade.

The value of imports into Brazil during 1928 exceeded £90,000,000, the second highest figure recorded. Of this trade the United States' share increased by 5 per cent. to £24,089,750, while that of the United Kingdom rose by 15 per cent. to £19,518,764. In the succeeding half-year, however, the American share made a rapid upward movement, while the United Kingdom's proportion declined. Germany has risen considerably in the list of suppliers to Brazil.

The figures of Brazilian electrical imports in 1928 were given in our issue of December 20th last (p. 1109), but it may be of interest to recall that Great Britain's share in the supplies of "material for electricity and electric light," which amounted to £1,247,000, was under 14 per cent.—the smallest for several years. Germany's share increased from 16 per cent. to 20 per cent., while the United States slightly more than maintained its position by supplying just over 50 per cent. The United States also supplied 35 per cent. of the electric motors (£251,000), 62 per cent. of the transformers (£207,000), and 33 per cent. of the dynamos and generators (£172,000). Great Britain's share was 15 per cent. of the motors, 8 per cent. of the transformers, and 18 per cent. of the dynamos and generators. Germany supplied 24 per cent., 18 per cent., and 35 per cent., respectively, having gained ground in all three directions at the expense of the United States in motors, dynamos, and generators, and at the expense of Great Britain in transformers. American and German manufacturers of electrical material have thoroughly efficient selling organisations, keep local stocks, and give expert service. By these means they have secured a very favourable position in the market.

The report says that in the north of Brazil gas engines are gradually being displaced by Diesel engines, while in the

south electric motors are ousting both. The demand for electric motors up to 50 h.p. is supplied from local stocks.

Trading Methods.

Mr. Irving, in common with all commentators on foreign markets, urges the necessity for a careful investigation of local conditions before entering the market. The success of United States' suppliers as compared with British traders is said to be due largely to their greater co-operation. On this account their selling is better organised and their credit information is more reliable. Nearly all the striking advertisements in Rio de Janeiro are American. Among other conspicuous signs are advertisements for refrigerators and electrical goods. While advertising is not a substitute for local representation, it is in many lines a necessary adjunct. Although contracts from the Federal State Governments are open to competition, only those suppliers who know when a competition is approaching, by keeping in touch with the Departments concerned, have much chance of tendering successfully. Tenders may only be presented by locally-established firms legally authorised to represent the manufacturer, and manufacturers in Great Britain who are not already represented but wish to compete should get into touch with the market and make provisional arrangements to save time. When tenders are called for goods which are known to be stocked locally, conditions of delivery are often such that only local suppliers can tender.

The report contains some useful information on commercial credit, and appendices give particulars of development in the various states, trade statistics, and other matters.

Belgium's Foreign Electrical Trade.

Statistics for 1928 and 1929 Compared.

IN the following table are given the weights of Belgium's imports and exports of electrical goods and apparatus in 1928 and 1929, with the principal countries of origin and destination and a note of increases or decreases.

It appears that Belgium's own capacity for building dynamo-electric machines is not as a whole equal to the home demand, as imports increased fairly substantially last year, while exports were just under half the imports, and showed a slight decline. On the other hand, exports of submarine and underground cables, as well as insulated wire, were very much greater than the imports. Belgium is also a larger exporter than importer of telegraph and telephone apparatus.

Imports.

	1928. Thous. kg.	1929. Thous. kg.	Inc. or dec. Thous. kg.
Dynamo-electric machines—			
Total	3,773	5,190	+1,417
From France	1,100	1,200	+ 100
,, Germany	1,059	950	− 109
,, Sweden	524	170	− 354
,, United States	64	760	+ 696
,, Switzerland	432	*	—
Dry batteries—			
Total	240	320	+ 80
From France	11	*	—
,, Denmark	134	190	+ 56
,, Germany	68	86	+ 18
Accumulators and plates—			
Total	320	500	+ 180
From United States	192	235	+ 43
,, Great Britain	14	20	+ 6
,, France	59	87	+ 28
,, Germany	31	51	+ 20
Cables, submarine and underground—			
Total	536	850	+ 314
From Germany	136	570	+ 434
,, Holland	354	80	− 274
Insulated wire and cable, other—			
Total	552	930	+ 378
From Germany	347	450	+ 103
,, France	86	70	− 16
,, Holland	23	94	+ 71
Carbons for electrical purposes—			
Total	434	710	+ 276
From Germany	110	220	+ 110
,, United States	237	270	+ 33
Electrical and electro-technical apparatus and parts not elsewhere specified—			
Total	2 816	3,980	+1,164
From France	1,014	1,250	+ 236
,, Germany	908	1,575	+ 667
,, United States	228	350	+ 122
,, Holland	143	270	+ 127
,, Great Britain	122	95	− 27
,, Sweden	168	115	− 53
,, Switzerland	210	225	+ 15
Insulators of porcelain, glass, &c.—			
Total	1,065	1,680	+ 615
From Germany	162	350	+ 188
,, France	837	1,090	+ 253
Insulating tubes, not metal covered—			
Total	36	30	− 6
From Germany	31	21	− 10
Insulating tubes, other, with junction boxes, &c.—			
Total	349	640	+ 291
From Germany	312	600	+ 288
Metal-filament lamps—			
Gas-filled (largely from Holland)	65	58	− 7
Vacuum, total	80	86	+ 6
From Germany	19	21	+ 2
,, Hungary	10	13	+ 3
,, Holland	50	37	− 13
Measuring instruments and parts—			
Total	255	356	+ 101
From Germany	96	125	+ 29
,, France	46	70	+ 24
,, Switzerland	99	123	+ 24
Telegraph and telephone apparatus—			
Total	205	475	+ 270
From Germany	64	170	+ 106
,, France	58	85	+ 27
,, Great Britain	38	57	+ 19

Exports.

Dynamo-electric machines—			
Total	2,600	2,500	− 100
To Belgian Congo	288	675	+ 387
,, Argentina	132	180	+ 48
,, Brazil	153	65	− 88
,, Great Britain	615	120	− 495
,, Holland	565	415	− 150
Dry batteries—			
Total	183	245	+ 62
To Holland	98	70	− 28
,, Great Britain	81	155	+ 74
Accumulators and plates—			
Total	667	630	− 37
To Argentina	264	42	− 222
,, Holland	104	130	+ 26
,, United States	—	80	+ 80
Insulators of porcelain, glass &c.—			
Total	122	170	+ 48
To Belgian Congo	15	9	− 6
,, France	13	46	+ 33
Cables, submarine and underground—			
Total	6 699	5,150	−1,549
To Belgian Congo	282	730	+ 448
,, Germany	1,067	590	− 477
,, Argentina	649	330	− 319
,, Great Britain	2.757	2,010	− 747
,, Holland	535	610	+ 75
Insulated wire and cable—			
Total	3,652	4,790	+1,138
To Germany	171	72	− 99
,, Belgian Congo	42	92	+ 50
,, Brazil	155	600	+ 445
,, Great Britain	682	1,340	+ 658
,, Holland	480	310	− 170
,, Argentina	440	77	− 363
Insulating tubes—			
Total	411	370	− 41
To Germany	19	17	− 2
,, Egypt	196	133	− 63
,, Greece	18	10	− 8
Metal-filament lamps of all kinds—			
Total	99	132	+ 33
To Belgium Congo	—	9	+ 9
,, Great Britain	10	8	− 2
Measuring instruments and parts—			
Total	34	26	− 8
Telegraph and telephone apparatus—			
Total	2,654	2,200	− 454
To Spain	19	160	+ 141
,, France	375	57	− 318
,, Italy	545	80	− 465
,, Holland	177	163	− 14
,, Switzerland	173	240	+ 67
,, New Zealand	57	*	—
,, Mexico	512	170	− 342
Electrical and electro-technical apparatus and parts not elsewhere specified—			
Total	1,202	1,450	+ 248
To Belgian Congo	240	463	+ 223
,, Egypt	39	12	− 27
,, France	135	141	+ 6
,, Holland	201	194	− 7
,, Syria	67	26	− 41

* Not specified.

Registered Electrical Contractors.

Annual Report and Meeting of the N.R.E.I.C.

THE report of the Executive Committee of the National Register of Electrical Installation Contractors for the year ended December 31st last shows that both income and expenditure were slightly higher than in 1928, but the favourable balance was increased. During the year 238 applications for registration were received (against 257 in 1928). Of these, 139 were accepted (against 124), 54 were declined and withdrawn (against 39), and 45 remained under investigation (94). The net addition to the Register was 140, as compared with 101 in the preceding year, raising the total to 1,318 as at April 4th last. It is seen that registrations have been cancelled in 182 cases since the inception of the Register. The principal reason (65 cases) was failure to renew registration; death and closure of business accounted for 51 cases; and bankruptcy, &c., for 46 cases. Only four cancellations were due to bad workmanship.

No additions have been notified to the list of authorities who confine installation work to registered contractors, but it is evident from the applications received during the year that where this stipulation exists, it is rigorously enforced. The sum of £400 allotted for advertising purposes carried on the publicity campaign until the end of October last, and a further sum of £261 has been appropriated to continue a systematic scheme of displayed advertisements in architects' and builders' journals for a further year. The aims and objects of the Register were brought to the notice of a large number of interested people by notes in the technical Press.

In pursuance of a settled policy the second annual conference with council members of the Electrical Contractors' Association was held in October last. A full and friendly interchange of views took place on many subjects, resulting in a better understanding of the problems which the National Register has to face. Arising out of this conference the Executive Committee decided to give local advisory committees the opportunity of recommending inspection of a contractor's work, whether on application for admission to the Register or on renewal of existing certificates, in those cases where they had any doubt as to the quality of the work. It was felt that such inspection would be of great assistance to local advisory committees in making their reports, and would strengthen the hands of the Executive Committee in weeding out those contractors whose retention on the Register is undesirable. In addition it would assist it in coming to decisions as to admission of applicants for registration and enable it better to attain one of the Register's principal objects, that of generally raising the standard of registered electrical installation contractors as a body. Another matter of importance arising out of this conference was the decision by the Executive Committee to consider the possibility and practicability of appointing an inspector who would periodically inspect work done by registered contractors in such districts as he might be visiting in the course of his professional business, and who would also be available for any particular inspection which the Executive Committee might from time to time desire to have made. In considering the present rules and conditions governing admittance to the National Register, this conference was of the opinion that under the present rules it was sometimes not possible to refuse admittance to contractors whom it is not desirable to have on the Register. It was decided to amend Rule 4 (*d*) so as to give the Committee power to decline an application without any obligation to disclose its reasons, notwithstanding that the applicant possesses one or more of the necessary qualifications.

During the year under review complaints of bad workmanship were made against nine registered contractors. Two of the contractors concerned appeared before the Executive Committee and their explanations in each case were considered unsatisfactory and inadequate. Their names were therefore deleted from the National Register and their certificates were cancelled. Three of the complaints were found on investigation to refer to installations carried out prior to the registration of the contractors concerned, and no disciplinary action was therefore possible, although a warning was given. In two cases the grounds of complaint were not well founded and the contractors' explanations were deemed adequate. In one case it was found on investigation that the work complained of was confined to one workman who was discharged and the work re-done at the contractor's expense. The complainant had since withdrawn the complaint. The last complaint was one in which breach of specification was involved rather than bad workmanship, and is still under investigation.

The Executive Committee again expresses its appreciation of the time and trouble that the members of the local advisory committees have willingly expended in carrying on the work, and for the very helpful suggestions which they have made from time to time. Owing to the appointment of Mr. F. W. Purse as chief engineer to the London and Home Counties Joint Electricity Authority, he had to relinquish his post as member of the Scrutinising Committee, and Mr. E. Calvert accepted the position. Mr. A. W. Barham was appointed a representative of the I.M.E.A. in Mr. Purse's place. The London and Home Counties J.E.A. accepted an invitation to appoint a representative to the Registration Board, and nominated Mr. F. W. Purse. The Electrical Wholesalers' Federation nominated Mr. D. Foster in place of Mr. Barnett. The remaining nominating bodies re-elected their retiring representatives to continue to serve on the Registration Board.

The Committee again places on record its thanks to Mr. P. V. Hunter, the chairman, for his able conduct of its proceedings throughout the year. It specially records its satisfaction that his invitation to the Central Electricity Board has resulted in that body deciding to support the Register and nominating Mr. J. A. Lee to serve on the Registration Board as its representative.

Annual Meeting.

The annual meeting of the Register was held at the Institution of Electrical Engineers on Friday last week. Mr. P. V. Hunter, the chairman, presided over a gathering of about twenty members of the Board.

Upon the presentation of the report, Mr. F. W. Purse said that the number of applications rejected was very significant, and Mr. Hunter pointed out that it showed the Register's intention to maintain a high standard. He also thought that additional supply authorities were confining their installation work to registered contractors, although they had not notified the Board. Members expressed their gratitude for the support and assistance given to the Register by the technical Press, and reference was made to the excellent relations which existed between the Register and the Electrical Contractors' Association. Mr. W. H. Walton said that a system of inspection was very necessary, and that applicants and registered contractors should be required to work to the I.E.E. Rules. Votes of thanks were accorded to the local advisory committees, the Scrutinising Committee, Mr. P. V. Hunter, and Mr. A. H. Dykes (vice-chairman).

The accounts were presented by Mr. W. R. Rawlings (hon. treasurer), who pointed out that the expenses were being met by renewal fees, interest on investments, and by appropriating £2 of each £5 entrance fee. He considered that the last should not be used for current expenditure, and that to meet the needs of the Register the annual renewal fee should be increased. The Register was already run very economically, and they could only finance an inspection service by adding to the income. Mr. H. Willoughby-Ellis (president, E.C.A.) said that inspection was very necessary, and that, in turn, would necessitate a code by which work could be judged. Entrance fees should be looked upon as capital, and to meet ordinary expenditure the renewal fees would have to be raised. After Mr. Walton and Mr. W. A. Shaw had supported these views, Mr. Willoughby-Ellis moved that the executive committee should be instructed to consider raising the annual renewal fee from one to two guineas; this was adopted. The following nominations to the Registration Board were approved:—Messrs. J. A. Lee (Central Electricity Board), F. W. Purse (London and Home Counties J.E.A.), E. E. Hoadley (Incorporated Municipal Electrical Association, *vice* Mr. J. Leadbeater), and Dr. J. W. T. Walsh (Illuminating Engineering Society, *vice* Mr. J. S. Dow). Messrs. P. V. Hunter and A. H. Dykes were re-elected chairman and vice-chairman, respectively. The amendment to Rule 4 (*d*), mentioned in the report, was then put forward by Mr. E. Calvert, who said that the Scrutinising Committee was frequently embarrassed because an applicant was often qualified under the rules but known to be unsuitable in other respects. Mr. Willoughby-Ellis said that one qualification for registration should be compliance with the I.E.E. Rules; that would obviate differences of opinion as to whether work was good or bad. Mr. Calvert pointed out that the Executive Committee had already drawn up a schedule of points to be considered for the guidance of local advisory committees. Mr. Hunter said that there was no doubt that a code would become necessary when inspection was instituted. The amendment was approved.

Messrs. W. A. Walker, E. Calvert, and D. S. Munro were re-elected to the Executive Committee, and the auditors were re-appointed.

The Chairman reminded the members that last year the question of forming a Scottish branch of the Register was raised. He regretted that no Scottish representatives were present to express their views. Mr. T. Trimnell (the Register's solicitor and former secretary) said that the formation of branches or committees was one matter which was not delegated to the Executive Committee by the Board. It was a matter, therefore, with which the Board itself would have to deal. On his suggestion, the Executive Committee was instructed to consider the formation of a Scottish branch or committee and to report to the Board.

After the re-election of Mr. W. R. Rawlings as hon. treasurer and a vote of thanks to the Executive Committee, the meeting closed.

Arc-welding Equipment.

Notes Descriptive of an Installation in a Large Boiler Works.

REMARKABLE progress has been made in the technique of arc welding during the last few years, and the success which has been attained in producing work that will withstand the tests appropriate to a wide variety of working conditions has resulted in the displacement of riveting for practically all tank work, even for vessels which have to stand high pressures. The necessity for efficient and reliable equipment for carrying out arc welding has led to very careful study of the special conditions to be met, and to the production of special generating units and control apparatus having characteristics which distinguish them from electricity generating plant used for other purposes. Amongst those who have developed arc welding equipment to a high degree of perfection, the English Electric Co., Ltd., holds a prominent place, and it may be said that this is the logical consequence of its wide experience, not only in the production of electric generating plant for every industrial purpose, but particularly in the design and manufacture of special direct-current machinery for both very-large currents and very-high voltages.

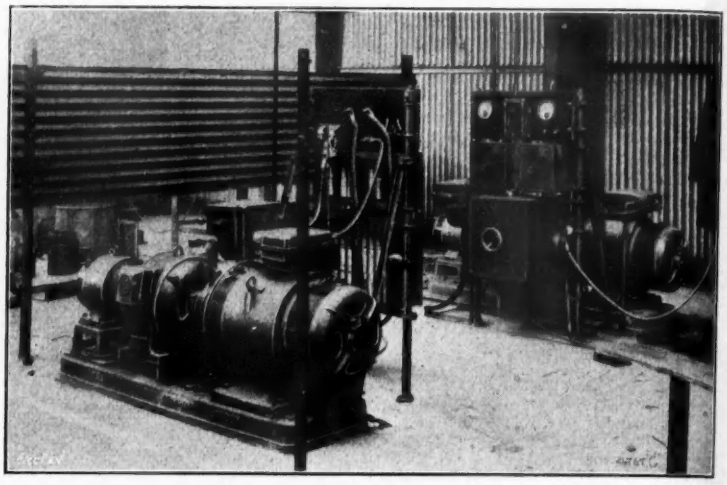
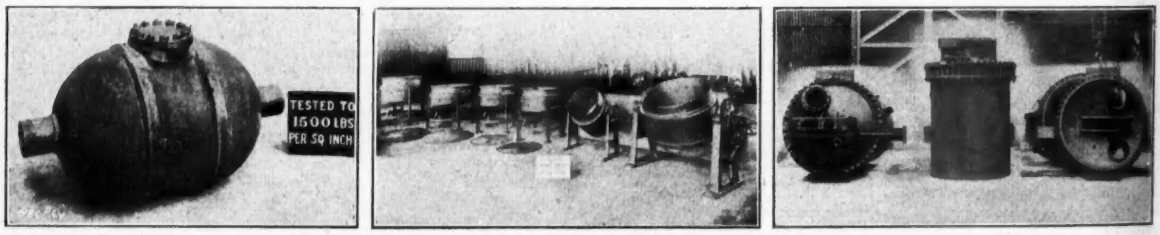


Fig. 1.—Welding Equipment with Simplified Control Gear.

With the permission of Messrs. Thompson Brothers (Bilston), Ltd., we are able to publish the following description and valuable data relating to an important electric welding installation in the tank shops of their Bradley Engineering Works, Bilston. and Hargrove, Ltd., consulting engineers to the works at Bilston. The results of this development work have been of the greatest value also to the English Electric Co. in



Figs. 2, 3 and 4.—Examples of Welded Products; Mild-steel Chemical Vessel, Stainless Steam-jacketed Food Vessels, and Oil Circuit Breaker Tanks for Grid Scheme.

This firm specialises in the production of difficult welded work of the highest class, and has done a very large amount of pioneer and research work, in the conduct of which the designing of its special electric welding plant. The class of work produced by Messrs. Thompson Bros. is indicated by the illustrations reproduced above as figs. 2, 3 and 4.

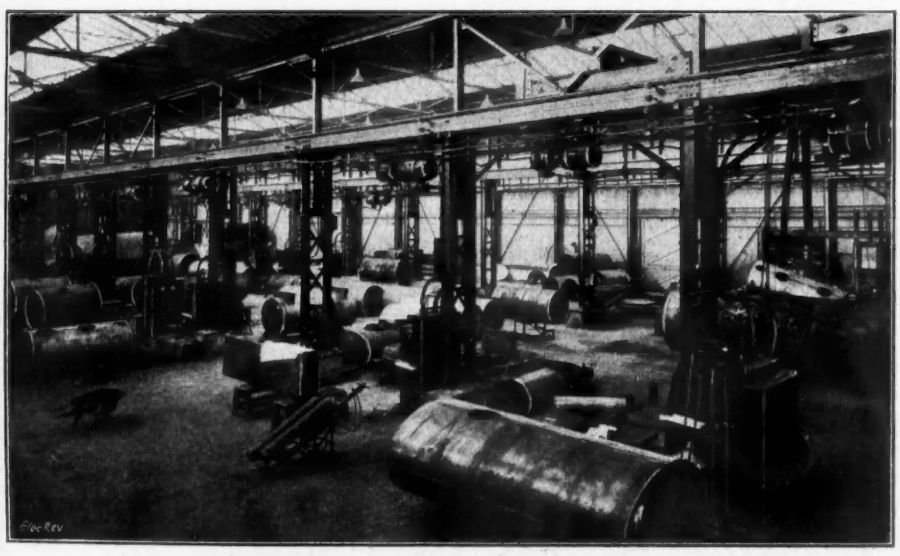


Fig. 5.—A Welding Shop; 12 " English Electric " Sets.

The requirements of a factory using welders dealing with a wide range of manufactures in which metal is used of all gauges up to about 2 in. may be summarised as follows: high overall efficiency, measured as the ratio of the output to the input in kW; perfect control of the arc to render the plant adaptable for heavily or lightly coated electrodes; arc stability without sacrifice of efficiency; robustness of the welding generators and control gear; and foolproof control gear to comply with the Home Office requirements.

The installation in question consists of twelve welder sets, each of which comprises a 10-h.p. squirrel-cage induction motor directly coupled to a steel frame welding generator capable of giving 250 to 300 A at 30 volts. From the general view of one of the shops given in fig. 5 it will be seen that each set is self-contained and is suspended from the underside of the main crane girders. This arrangement has the great advantage of keeping the floor

an important part has been taken by Mr. Ernest Crosse, chief engineer to Messrs. Thompson, and by Messrs. Bostock

space perfectly clear, and also of ensuring a large measure of protection to the machine from loose pieces of metal. The sets are designed to give their full output continuously for one hour, and are fitted with ball bearings having grease gun nipples, so that they require practically no attention for long periods.

The exciting current for the field magnets of all the welding sets is drawn from two exciter sets, which are also suspended from the main crane girders. These are controlled from a sheet-steel cubicle mounted on the floor of the shop. The control gear is designed in such a way that the excitation current for all the welder sets can be supplied by one exciter, or, alternatively, the two exciters can be run in parallel. The excitation current is set by the foreman of the shop, and the cubicle is so locked that no one else can interfere with it. As shown in the illustrations, the cables between the exciters and the welding sets, and between the latter and the service points, are run on racks suspended from the crane girders. Single-wire armoured cable is used, and the armouring is clamped at the machines and at the control gear, so that there is a continuous earth throughout the shop equipment back to the sub-station. Fig. 6 shows one of the sheet-steel cubicles containing the control gear for a welding set, and in connection with this equipment there are some interesting features. The ammeter on the left-hand side is calibrated, not only in amperes, but also in electrode numbers, and in this way the operator is able very easily to adjust the excitation current and divertor resistance without loss of time. The oil-immersed star-delta starter for the motor of the welding set is controlled by a handle outside the cubicle on the right-hand

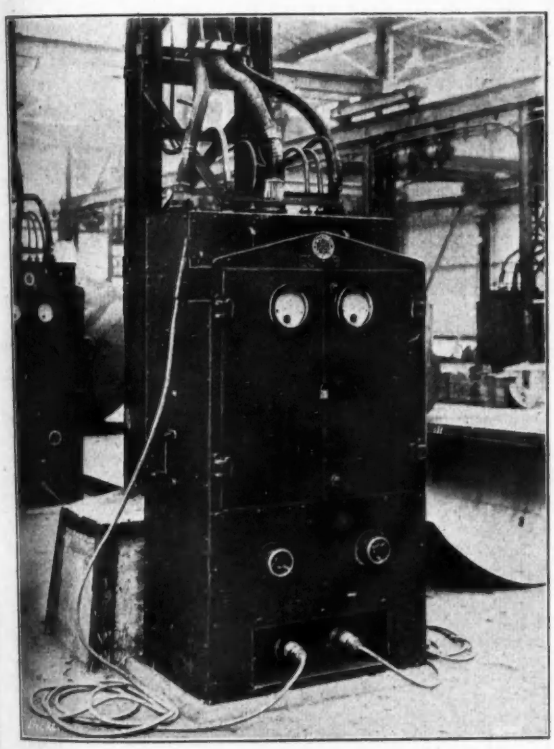


Fig. 6.—Welder-set Control Cubicle; Sheet-steel.

side, and an auxiliary trip is incorporated which shuts off the excitation current from the generator when the motor is stopped. In order to obtain fine adjustment of the arc current, the shunt field current of the generator is regulated by means of a resistance mounted at the bottom of the cubicle, actuated by the hand wheel shown. In addition to this the current in the series turns of the generator field is controlled by a multiple-step divertor, which is mounted on the right-hand and actuated by the right-hand wheel. Stability of the arc is ensured by the provision of a reactance in the arc circuit, and this reactance is mounted within the cubicle and provided with a switch by means of which half of it can be cut out, if necessary. The handle operating this switch can be seen on the left-hand side. The flexible cables from the electrode holders, and from the clips which are attached to the work to be welded, are connected to the cubicles by plugs which are interchangeable. The importance of this interchangeability lies in the fact that certain electrodes work much better when the negative side is earthed, while other types give better service with the positive side earthed. Therefore, the plugs are arranged so that the earth return cable is connected automatically to earth, that is to say, to the armouring on either the positive or the negative side of the generator.

All the control cubicles are fitted with padlocks to avoid unauthorised interference with the connections, and in order to render the cubicles safe for the carrying out of adjustments or repairs to any of the apparatus, links are provided in the busbar chamber at the top for the purpose of completely isolating the cubicle from the exciter and motor circuits.

Some tests taken on these sets prove that the average overall efficiency lies between 70 per cent. and 80 per cent., according to the class of work being done. Machine loadings varied from 60 A to 180 A for material thicknesses of from No. 12 to No. 4 gauge.

The plant we have just described is of a type particularly designed for works requiring a large output of heavy welded articles, but there are many instances in which welded articles of only one class have to be dealt with, or where the welding plant is required intermittently. In these cases the capital outlay for the plant and control gear has to be on a more modest scale, and to meet such requirements the English Electric Co. has put on the market a simpler type of control gear which, although cheaper, embodies all the essential features previously mentioned. Fig. 1 depicts an outfit of this description; the generators are of the type already described, with the exception that a direct-coupled exciter is mounted on the same bedplate, instead of forming a separate unit. The same shunt field resistance, divertor and reactance are used, but the whole gear is simplified by the use of plain terminals instead of plugs for the flexible leads, the omission of the switch for cutting out half the reactance, and the absence of interlocks between the excitation current and the motor starter and of the variable resistance in the shunt field of the exciter.

The following data concern a test conducted over a period of 18¼ days on the 12 sets and another in the installation referred to: Total kWh, 3,976; cost of energy, 0.95d. per kWh, £15 14s. 10d.; total electrodes, all sizes, 18,292; electrodes used per unit, 4.5; cost of energy per electrode, 0.21d.; cost of energy per 1,000 ft. of electrode, 11s. 6d.; and electrodes per machine per day, 76.

A Heating Installation.

Particulars of the thermal-storage installation at the headquarters of the Metropolitan-Vickers Electrical Co., Ltd., at Newcastle-on-Tyne.

IN the "all-electric" Metro-Vick House, Newcastle-on-Tyne, the new premises of Metropolitan-Vickers Electrical Co., Ltd., in that city, thermal-storage central heating is employed to enable full advantage to be taken of the lower charges offered by the Newcastle-upon-Tyne Electric Supply Co. for night loads. The supply at the lower rate is only available between the hours of 7.30 p.m. and 7.30 a.m. (with the exception that, in case of emergency, a boost at mid-day for a short time is permitted), and, in order that heat may be applied at any time required, and the building, which is roughly of 250,000 cu. ft. capacity, may be kept at a reasonable temperature throughout the coldest day, a cylinder 22 ft. long by 8 ft. diameter, with a capacity of about 8,000 gal. of water, is heated to about 240° F. at night by four 50-kW immersion heaters designed for a 480-volt single-phase supply. The four immersion elements are controlled by a 500-A double-pole contactor, operated *via* an auxiliary contactor by thermostats in the cylinder and a time switch installed by the Supply Company, so that the operation of heating the cylinder is entirely automatic.

For the actual heating of the building, wall radiators are employed, and the water is circulated through them at a temperature of about 140° F. In order to maintain a steady temperature and conserve the heat in the cylinder, a three-way auxiliary valve is installed, connected on the outlet side to the main riser of the circulating system, and on the inlet side to the thermal-storage cylinder and the return main from the building. This regulating valve is operated by hydraulic pressure controlled from a thermostat in the outlet pipe, and so regulates the flow of hot and cold waters that the desired temperature is maintained, irrespective of the temperature of the thermal-storage cylinder.

Although the heating of the building is designed to work on thermo-siphon, in order to accelerate the heating during the winter, a 1-h.p. motor-driven booster pump is installed, which increases the rate of circulation. This pump is not arranged for automatic control, but is started and stopped, as required, by hand.

With the 200-kW of heating installed, a total of 2,400 kWh, or 8,188,000 B.th.u. can be added to the system each night, and this is considered to be ample to replace the losses from the building on the coldest day. The domestic hot-water supply for washing and cleaning is also heated at night. A 150-gallon vertical cylinder is used, this being heated by four 2-kW immersion heaters, which are controlled by contactor, thermostat and time switch. The water is used direct, and the maximum temperature does not exceed 180° F.

The heating installation was carried out by Messrs. R. W. Cairns, of Newcastle. The heating elements and thermostats for the thermal-storage cylinder were manufactured by Messrs. Souter, and supplied by Messrs. Nathan & Allen. The mixing valve and thermostat were supplied by the Drayton Regulator Co., Ltd., and the booster pump by Messrs. Holden & Brooke, Ltd. The heating elements for the domestic boiler were supplied by Messrs. Metro-Vick Supplies, and the necessary contactor control gear, switches, and motors by Messrs. Metropolitan-Vickers Electrical Co., Ltd.

Textile Mill Lighting.

While quite 90 per cent. of the textile mills in this country are electrically illuminated, those that can be considered to be well lighted at present are liberally estimated at not more than 5 per cent.

By S. ANDERSON, B.Sc.

(Extracts from a lecture delivered under the aegis of the ILLUMINATION ENGINEERING SOCIETY.*)*

THE magnitude of the industry whose lighting is under review is revealed by the facts that a total of 794,000 operatives are engaged in the cotton and woollen industries alone; 66 million spinning spindles and about 860,000 looms are installed in the mills. Notwithstanding the tendency towards the use of fully- and semi-automatic machinery, a considerable amount of work involves acute vision; yet, though in parts of some mills modern industrial lighting methods have been introduced, the great majority of mills in this country are lighted in an inefficient manner with obsolete equipment. The chief contributory causes seem to be lack of knowledge of the subject and lack of appreciation of the advantages of modern lighting.

Many textile mills in this country generate their own electricity by means of dynamos driven by the main mill-driving engines, and hence the cost of power to them is negligible. They have, however, in most cases, considerable objection to increasing their lighting load owing to the fact that their generators are already fully loaded, and any extensive improvement of lighting would necessitate the installation of new dynamos, probably accompanied by additions to cables. In many instances a power allocation of as little as one watt to six square feet of floor area has been encountered.

Considerable intensity is particularly necessary for weaving, though illumination does have a notable effect on spinning also. Though as a rule light colours predominate, many of which have very good coefficients of reflection, it is usually in the woollen trade that the highest intensities for weaving are necessary. For many processes the size and layout of machinery are fairly well standardised. In many cases, particularly in the woollen industry, ceiling height is such in relation to the height of machines that it is impossible to employ a sufficient mounting height for the lighting fittings to allow of alternate aisle spacing, and the less economical method of individual aisle allocation has to be employed in order to provide direct lighting on the working planes in each aisle. When new mills (of the block type) are being built the allowance of ample ceiling height for both day and artificial lighting would be well worth while.

The B.E.S.A. standard dispersive reflector is suitable for the great majority of textile mill lighting, and when no other type is specified it is to be inferred that it will be applicable. In the case of 60- and 100-watt units the "Pearl" lamp, which is as yet little used in the industry, seems to be the most suitable from all points of view. For larger units, opal or bowl, frosted lamps provide the most suitable light from the point of view of diffusion and freedom from glare.

In Lancashire mills bales of various qualities of raw cotton from different sources are blended before being fed to the machines, and a certain amount of colour discrimination is involved. As a rule this inspection is carried out in daylight and the proportions determined for the rest of the day, so that fine discrimination by artificial light is unnecessary. "Daylight blue" lamps are, however, employed in this department by one or two firms and they do make the grading possible after dark. In the cotton bale opening and scutching department general lighting is applicable in the majority of cases, so arranged that lighting units are not located directly over the machines, in order to avoid anything falling into them. The existing intensity is of the order of 0.5 foot-candle, but it is suggested that a minimum of 3 foot-candles should be provided to facilitate machine adjustment and inspection.

The primary processes in the woollen industry differ considerably. Almost all the wool is gone over by hand, being judged by texture, impurities, and colour, and opinions differ considerably on whether the use of "daylight blue" lamps over the sorting benches make sorting under artificial light reliable or not. Wherever possible, even when "daylight" lamps are installed, sorting is only carried on during daylight.

There is every reason for supposing that, with an intensity of 10 foot-candles of colour-corrected light on the inspection benches, sorting could be reliably carried out once the operatives had become accustomed to the difference between artificial daylight and the genuine article.

After sorting the wool passes through washing and drying machines and a considerable amount of water vapour is evolved, so that the lighting units should be of a totally-enclosed vapour-proof type, incorporating a reflector preferably.

In the linen industry different initial processes are involved. Bales of flax fibre are first dressed by hand. Long benches with steel combs for each operative are provided, and the fibres are drawn through a handful at a time to straighten them and remove short strands. No fine work is entailed, but sufficient illumination must be provided for the operatives to see how complete is the dressing of their fibres; 4 foot-candles is adequate over the benches.

Some of the machines used are large and normally reach almost up to the ceiling, so that grouped lighting becomes necessary. Some illumination must, however, be provided all round for inspection, and it is important to eliminate heavy shadows over moving parts and from gangways. Other machines are from 2 to 4 ft. high only, but may be over 100 ft. long (*e.g.*, spinning mules) and general lighting is adequate, partly in the horizontal and partly in the vertical planes. In some locations there is room for a fitting having a horizontal polar characteristic of an elliptical, or similar, form, so that wider spacing than that allowable with the standard dispersive reflector could be used. It would be desirable to retain the same angle of cut-off, so as to avoid glare.

The delivery ends of the machines are the most important from the lighting point of view, as the operatives must watch for inequalities and irregularities of output. As an example of ring or cap spinning frame lighting an installation may be mentioned which consists of 100-watt units spaced 12 ft. 6 in. apart at a height of 10 ft., the resultant intensity of which is 5½ foot-candles. Higher intensities are rarely met with in spinning sheds, though another example, a staggered arrangement with 200-watt units in each gate, gave an average value of 7 foot-candles. In this case, the height of the bobbin creels on top of the spinning frames is nearly 6 ft., and alternate gate lighting was, therefore, impracticable.

Mule spinning, though not producing such an even yarn, is still largely used in Lancashire, and mule rooms are frequently very large. It is common practice to locate a row of lighting units along the centre of the gate between each two mule frames, and the average intensity on the working plane seldom exceeds 0.7 foot-candle. Each attendant may have up to 1,000 spindles each to watch, so that considerable visual effort is entailed and an adequate intensity of illumination is very desirable. American practice is to provide a minimum of 6 foot-candles for natural yarns and 9 foot-candles for dyed yarns, which values appear to be very reasonable. In one case, in which dark coloured wool was being spun, a trough running the whole length of the frame was suspended about 8 ft. above the floor, open on the under side and painted white, containing 60-watt "Pearl" lamps at 6 ft. centres. This gave 7 to 8 foot-candles on the work, and was particularly free from glare owing to the depth of the trough.

In the drawing-in operation each warp thread from a beam is drawn through an individual mael or eye of a heald shaft by hand, though a machine to accomplish this operation is just being introduced into this country. There may be as many as 1,000 threads on one beam and, in consequence, the operation is a long and exacting one, for which a high intensity of light over a small area of the healds is required. A general illumination of 6 foot-candles, supplemented by a 60-watt local lamp in an angle reflector close to the work gives very good results in practice; the local lamp can be moved by sliding the rod from which it is suspended along the top of the main frame. The actual intensity on the work is thus maintained in the region of 70 foot-candles, which ensures a minimum of eyestrain and maximum facility for the operative engaged in this very fine work.

For weaving various types of loom and material woven give rise to varying lighting requirements, and it is common practice to use two 60-watt lamps with conical shades over each loom front and one over each back; in this case the illumination on the horizontal is 8 to 9 foot-candles and on the vertical healds 3 to 4 foot-candles. While this system gives very

bad glare, it has the advantage that, as the lamps are hung from counterweighted cords, it is possible for the weaver to adjust the position of his lamps to throw light just where he particularly needs it at any moment. B.E.S.A. reflectors would give good results in this case. Installations without local lamps have been introduced with very good results. The most difficult part of the loom to light adequately is the reed, which is a sort of steel comb through each of whose dents passes one warp thread, is more or less vertical, and is overhung by the top beam of the sley, which is necessarily wide in order to prevent any tendency to bend when forced against the weft after each pick of the shuttle. Some weavers cannot work satisfactorily without some local lighting as well, so that some well-shaded form of local lighting must be provided in these cases. In reasonable daylight these looms receive anything up to 50 foot-candles of horizontal and vertical illumination, and it is of interest to note that even under such illumination a weaver whose efficiency may average 80 per cent. on light-coloured work only averages about 65 per cent. efficiency on dark material.

Tests made of the stoppage time of looms weaving suiting cloths show that a loom may be stopped as much as 30 per cent. of its working period due to broken warp or weft threads, or shuttle changing, and during this time the weaver is especially in need of good illumination.

The woven material passes to the inspection and mending department, where any flaws are rectified. Inspection, known as "perching," calls for a considerable intensity of illumination and, except the case of mixture cloths, must be of daylight quality; for use on dull days and after dark, colour-correcting lamps behind screens are frequently used.

In general, intensities at present prevalent are far below what can be considered good practice, and the majority of lighting installations have been carried out with little regard for the principles of good lighting. Quite 90 per cent. of the mills employ electric light, and the standard illumination in those employing gas is considerably below the average standard of those using electric light. It is remarkable that, while there is a general tendency to employ up-to-date plant, this tendency is almost always absent when lighting equipment is concerned. It is to be hoped that the industry will make a rapid recovery towards re-establishing its prosperity, and thus make possible the necessary expenditure in the cause of better lighting.

Developments at Douglas, I.O.M.

A description of the mercury-arc automatically-operated rectifier sub-stations recently installed in connection with the municipal electricity undertaking reconstruction scheme.

THE recently completed reconstruction scheme of the Douglas, I.O.M., Corporation electricity undertaking provides a new steam generating station and three automatic mercury-arc rectifier sub-stations. The new generating station is equipped with a 1,000-kW turbo-alternator set, which is to take the basic load, the peaks being provided for by the old oil-driven station in which two motor-driven alternators have been added to the d.c. generating plant. The rectifier sub-stations are situated roughly round the perimeter of Douglas, and feed into the interior d.c. networks. Outside the town area a.c. is supplied, 3-phase, 4-wire.

Each sub-station is divided into two units (see fig. 1). A balancing unit feeding a 3-wire supply into the d.c. network consists of two 44-kW, 220-V rectifiers, each connected between an outer and the neutral wire; this unit can be operated independently. The rectifiers are fed from the e.h.p. supply by a 3/6-phase transformer, *via* two regulators, giving independent voltage control for each bulb, that is, for each side of the mid-wire.

A line unit delivering a two-wire supply into the d.c. network consists of a 132-kW, 440-V rectifier connected across the outers of the system. This unit can also be operated independently of the balancer unit if necessary. It is also fed off the e.h.p. supply by a 3/6-phase transformer, *via* a regulator.

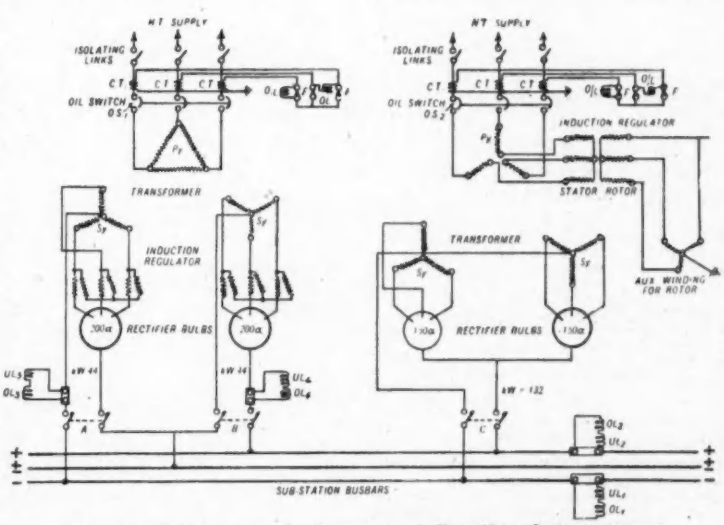


Fig. 1.—Diagrammatic Lay-out of Rectifier Sub-station.

Each sub-station is designed for completely automatic operation and is started when the voltage on the d.c. network decreases to a predetermined value. The balancer rectifiers start up first and supply load to the system, maintaining a voltage balance. Should the load demand exceed the capacity of the balancer rectifiers, then the line rectifiers will start automatically to help the balancers.

The two sets now operate in parallel, supplying the d.c. network and maintaining the correct voltage across the outers and between each outer and the neutral wire at the desired pressure. Out-of-balance load is dealt with as well as automatic sharing of the load between the two units in the correct proportion. When the load demand decreases, the line rectifiers shut down first by means of underload relays and leave the balancers running.

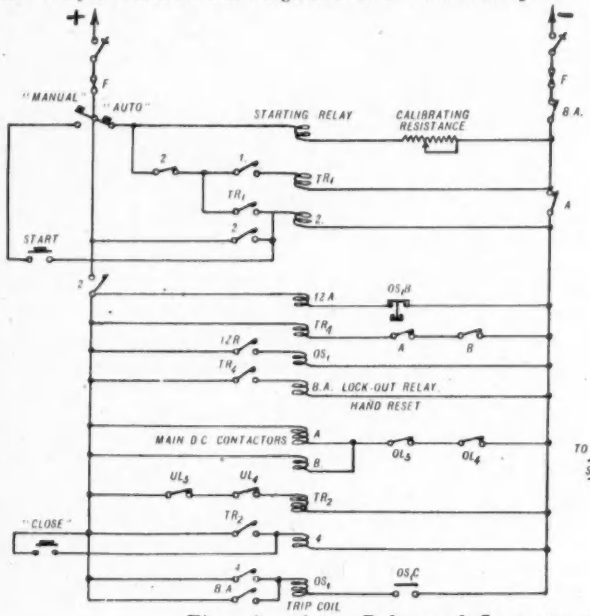
Should the demand further decrease and the voltage remain at its normal value, the balancers will shut down, leaving the sub-station plant ready for starting again as and when required.

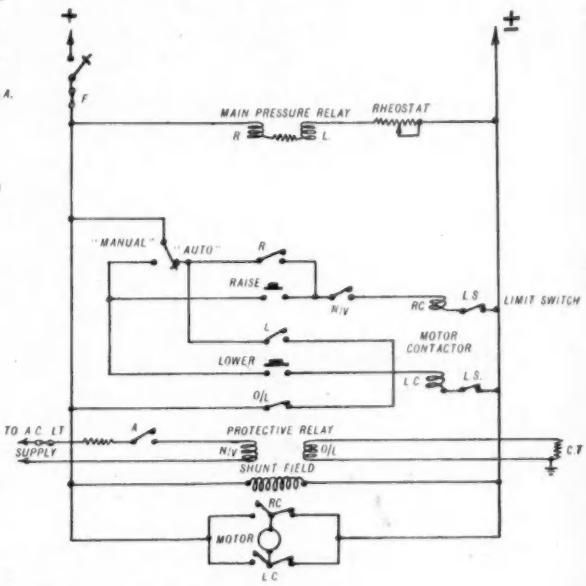
Referring to fig. 2, the detailed operation of the control gear is as follows. When a decrease of the pressure of the d.c. network occurs the following sequence of operation takes place. The starting relay No. 1 allows its contacts to close and energise relay TR1. Time-delay starting relay TR1 closes its contact after about four minutes and energises contactor 2. Contactor 2 closes, cutting out TR1 and, at the same time, energising the main d.c. contactors A and B. Contactor 12A and stalling relay TR4 are also energised. The d.c. contactors A and B close, so connecting the balancer rectifiers to the d.c. network. The stalling relay TR4 is cut out. The contactor 12A, on closing, energises the closing solenoid os1 of the balancer e.h.p. switch, which on closing, energises the main transformer, and the bulbs automatically tilt and start on their exciter anodes. The bulbs are now ready to take load. Contactor 12A opens when the e.h.p. switch closes, due to the auxiliary switch os1s opening after a short delay. The d.c. and a.c. switchgear closes at about the same instant. With the closing of the d.c. contactors, the protective relays on the induction regulators have their no-volt coils energised, allowing the main pressure relay RL (see fig. 3) to run up the regulators to the desired voltage and so load the rectifiers gradually. The load on the balancers now causes the underload relays UL3 and UL4 (fig. 2) to open their contacts until the load again decreases. Relay 1 re-sets due to the higher voltage.

Should the load demand increase to the full capacity of the balancers, or of either balancer alone, the line set will be automatically brought in by the closing of the e.h.p. switch by a similar control panel to that described above for the initial switching in of the station, with the exception that the operation is started by a load relay on the balancer set instead of of the pressure-starting relay (see fig. 2).

In the meantime, whilst the rectifiers (either balancers only or line and balancers) are in operation, the regulators are automatically controlled for maintaining the pressure at the desired value, the control for each regulator being as follows. Referring to fig. 3, when the d.c. pressure decreases, the main pressure relay RL closes its contact R and energises the motor contactor RC. Contactor RC closes and connects the armature

of the permanently-excited shunt motor to the supply. The motor starts and rotates the induction regulator in the direction to raise the pressure. When the desired pressure is reached the main pressure relay opens its contact R, which, in turn, opens contactor RC, and the motor stops. The d.c. pressure increases, the main pressure relay closes contact L, which lowers the pressure to the desired value in the same manner as for raising. Manual control is provided by "auto-manual" change-over switch and push buttons. The protective relay NV-OL lowers the regulator to the minimum position should the a.c. pressure disappear, and protects the rectifiers during overload by keeping the pressure at a reduced value until the excessive load disappears. All the three regulators are thus controlled, and so the pressure is correctly maintained, not only across the outers, but also from each outer to the midwire, no matter what the out-of-balance load conditions may be. Also, a load-sharing relay between the two sets of control gear insures against wrong load distribution.





Figs. 2 and 3.—Relay and Contactor Connections for Automatic Working.

For the shut-down operation (referring to fig. 1) with both the balancers and line sets in operation and a decrease in the load demand occurring, the line set always shuts down first, due to operation of the underload relays UL1 and UL2. The balancers carry the load as before until the demand decreases still further, when they are automatically shut down by the underload relays UL3 and UL4. The sequence is identical for each set and is as follows. Relays UL3 and UL4 close their contacts and energise the time-delay stopping relay TR2. After a delay of about 3 minutes TR2 closes its contact and energises contactor 4. Contactor 4, on closing, energises trip coil OS1 of the e.h.p. switch and de-energises the balancer transformer by isolating it from the e.h.p. supply. Trip coil OS1 is de-energised by the opening of the auxiliary contact OS1c on the e.h.p. switch (see fig. 2). Contactor 4 also de-energises contactor 2, which, in turn, de-energises the d.c. contactors A and B, thus isolating the balancer rectifiers from the d.c. network. Contactor 4 opens due to 2 opening. The induction regulators run down to minimum position, due to the coils N/V on the protective relays being de-energised (see fig. 3).

The sub-stations are protected against the following conditions: sudden overload on the d.c. side; gradual overload on the d.c. side; fault on a.c. side in any phase; fault on automatic panels; non-completion of starting sequence; alteration of starting d.c. pressure; and alteration of maintained d.c. pressure.

The rectifiers were supplied by the Hewittic Electric Co., Ltd., and the scheme was designed by Messrs. Handcock and Dykes, consulting engineers to the Douglas electricity undertaking.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A New Fire-alarm System.

In a publication of the National Fire Brigades' Association, 8, Waterloo Place, Pall Mall, S.W.1, "Red Book" No. 253 (price 2s. 6d.), some particulars are given of the "Thermo" fire-alarm system submitted for test by Messrs. JOHN KERR AND CO., Manchester, and also of the results of the tests thereon. The working of the system depends upon the thermostatic principle. The heat-sensitive unit of the detector comprises a hermetically-sealed flexible chamber (similar to that of an aneroid barometer) formed by two thin corrugated metal disks with wired edges. This chamber contains a medium which expands on a rise of temperature, causing the disks to become more convex, and by this means an electrical contact is made, completing a circuit, and so through a relay the alarm gong is rung. This mechanism and the flexible chamber is contained in a casing which is made for the most part of bakelite or some similar substance, the perforated protecting face of the flexible chamber being of copper. Normally the electric circuit is "open," and when operated it becomes "closed." The detector, fig. 1, is so constructed that it can be adjusted to function at any predetermined temperature between 80 deg. and 180 deg. F. All the detectors tested were stated by the testers to have been adjusted to operate at 80 deg. F. One of the detectors was placed in water in a tin cup which

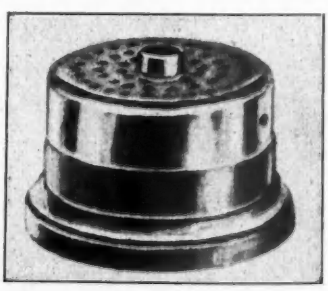


Fig. 1.—The "Thermo" Fire-alarm Detector.

was gradually heated by means of a small methylated-spirit stove, and on the temperature of the water reaching 80 deg. F.

the alarm operated. A feature is that every detector is fitted with a push-button by means of which the electrical circuit can be tested without affecting the sensitive chamber. The electrical circuit, including the bell, indicator, batteries, &c., employed in the test, was of ordinary pattern, and although fitted for the purpose of the tests with the detector, it was not subjected to electrical tests for efficiency.

A Lamp-testing Wattmeter.

Messrs. RUNBAKEN MOTOR AND ELECTRICAL ACCESSORIES, LTD., Magneto Works, Ardwick, Manchester, have introduced a new multi-range lamp-testing wattmeter, a special feature of which is that it can be used on any pressure, either a.c. or d.c., from 200 to 250 V. Another model is made for 100/150 a.c. and d.c. A model suitable for one fixed voltage only is also available.

An Improved Shade Gallery.

The "Quickfix Binkie" gallery, a product of the "QUICKFIX" ELECTRICAL FITTINGS CO. (1928), LTD., 47, Sauchiehall Street, Glasgow, has been designed to overcome the difficulties pertaining to ordinary shades with 1¼-in. holes for ring fixing. In the lower part of the gallery there are three arms, two of which carry controls for the fingers, all attached to a spring which, when the controls are compressed by the fingers, contracts to enable the arms to pass through the hole in the shade and, on release, expand to allow the arms to rest under the shade, thus holding the latter securely. The second patent incorporated consists of a serrated edge at the upper part, which allows the gallery to be attached to the lampholder by the simple operation of pushing it on to the threads. To remove the gallery it should be unscrewed, but this, of course, would only be necessary if the lampholder had been damaged. Fig. 2 shows a "Quickfix Binkie," in part section, fitted to a lampholder.

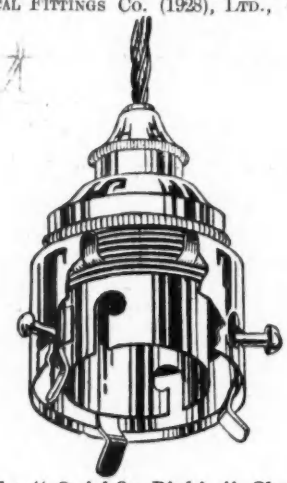


Fig. 2.—The "Quickfix Binkie" Shade Gallery.

A High-speed Butt Welder.

Messrs. HOLDEN & HUNT, Cox's Lane Works, Old Hill, Staffs., have placed on the market a high-speed butt welder designed to cope with high-speed mass production in all classes of mild- and alloy-steels. It is particularly suited to such work as the welding of brake rods and valve stems, where accuracy and high tensile strength of weld have to be obtained over large quantities of products with absolute uniformity. The machine is rated at 15 kW, and will weld at high speed up to ½ in. dia. mild- or alloy-steels. The work is gripped in copper jaws cut out to suit the shape of the job. The jaws are easily interchanged, and are fixed to sliding vice-heads controlled by right- and left-hand vice screws, thus being self-centering. The heads are water-cooled and are accurately mounted on massive slides, ensuring great accuracy of alignment. The high speed of welding is not obtained by increasing the welding voltage, but by using the smallest possible upsetting gap. Instead of an ordinary upsett burr, a thin fin is produced which can be very easily removed. Owing to the small volume of heated metal the kWh consumption is less, it is claimed, than with ordinary butt welding. The speed of welding varies from about half a second to 1½ sec., according to the area of the weld and the class of metal. The welding is effected by a simple stroke of the pedal, which automatically performs the sequence of operations to complete the weld. The mechanical pressure device is highly efficient, and it has been found possible to weld many varieties of steel alloys which ordinarily are not considered a practicable welding proposition. The electrical efficiency is over 90 per cent., and the power factor 0.8 per cent. The makers claim to have been particularly successful in preventing overheating of the metal in the weld, as immediately the metal reaches the plastic stage the current is automatically switched off. The machine is fitted with a four-way voltage regulator graduated in carefully-defined ratios to cover the whole range of welding. This machine embodies the results of experiments covering several years, and represents a distinct advance in the application of the low-voltage process.

Ship-shore Radio-telephony.

A brief review of some of the technical aspects of the recently-inaugurated intercommunication service between ocean-going ships and land-line networks.

By Col. Sir THOMAS F. PURVES, President, I.E.E.

(*Extracts from an address delivered before the* STUDENTS' SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE most recent development of electrical communication engineering has been the inauguration of services whereby ordinary telephone subscribers in Britain, the U.S.A., and certain European countries can communicate with suitably-equipped ships at sea.

The services and experiments now being carried on are based on the use of short waves, and in the case of the experiments made from America effort was concentrated first upon securing reliable communication when the ship was comparatively near to the land. This might at first sight appear to be easy, but it is in effect the most troublesome part of the problem, for the attenuation of the "ground" wave is very rapid in the case of short waves, and the "sky" wave only materialises beyond a certain distance from the transmitter. The "skipped distance" is difficult to cover, but it has been done successfully in America by (*a*) the use of longer waves than those used for the longer ranges of distance, frequencies of the order of 4,200 and 8,700 kilo-cycles (71 and 35 metres) being employed for the shorter ranges; (*b*) erecting the station quite close to the water's edge, so reducing ground attenuation as much as possible, since the attenuation of "ground" waves when travelling over sea is much less than over land. Furthermore, the land transmitting station has been erected at a point where the direction of the ship's travel, while near the land, will intersect the coast line and thus make the transmission strongly directive for that portion of the voyage, A B, fig. 1, which shows the limits of the routes normally taken by liners crossing the Atlantic Ocean. The dotted line is the winter route and the full line the more southerly route followed in early summer when floating ice is liable to be met with further north. The great circles from Rugby embracing the routes are indicated, and it will be noted that the direction of transmission is far from constant.

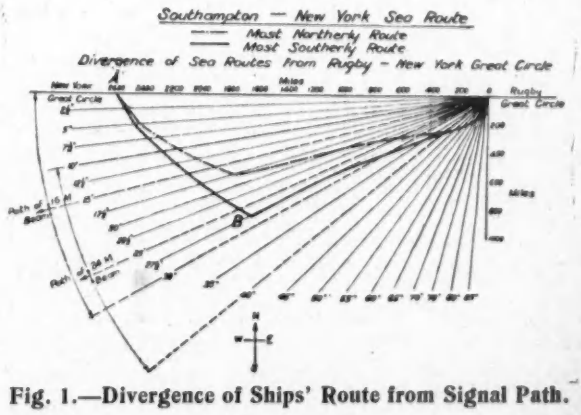


Fig. 1.—Divergence of Ships' Route from Signal Path.

Experiments made from Britain were designed to cover the major portion of the voyage, leaving the short-range problem for solution later. There are several important ports to be considered, instead of one, and it is hardly possible, even if desirable, to locate the land radio stations where the near-in route direction intersects the land, as in the American

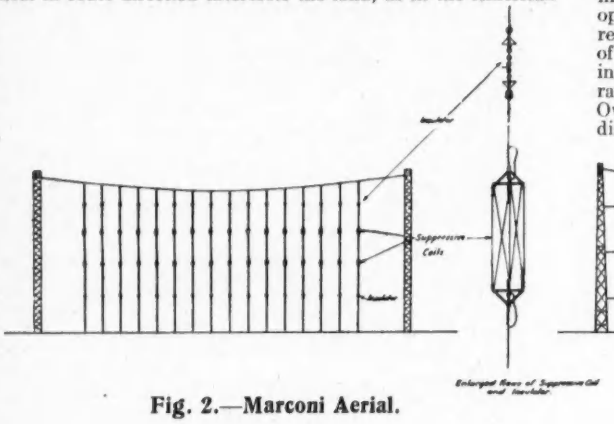


Fig. 2.—Marconi Aerial.

case. From the points of view of economy of maintenance and operation and accessibility of high-grade land-lines, the transmitter is situated at Rugby and the receiver at Baldock.

Three principal wavelengths, of 16, 24, and 36 metres, are in use, and experiments are also being carried out with wavelengths of the order of 70 and 100 metres. The longer waves (36, 70, or 100 metres) are used for short-range transmission and are radiated from plain (non-directional) aerials in order that they may communicate with ships near any British port. The two shortest waves (16 and 24 metres)

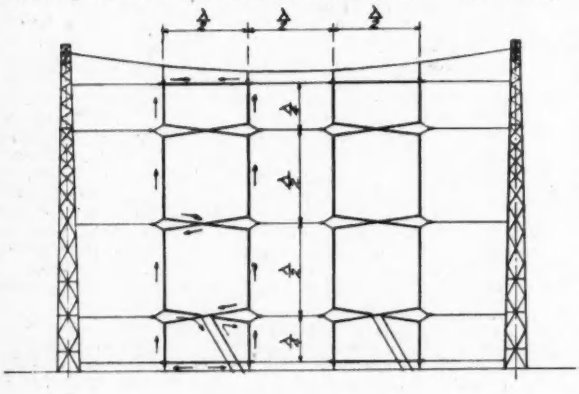


Fig. 3.—Sterba Aerial.

are used for long-range work, and are radiated from directional aerial arrays, which concentrate the transmitter energy into a beam in the required direction. The wide bearings necessary to cover the ocean route prevent the use of a highly-directional system, and a beam spreading at an angle of about 30 deg. has therefore been provided. The 24-metre array is so directed that the beam covers the average position of the ship for the first 2,000 miles or so, up to point B (fig. 1), while the 16-metre wave is arranged to cover the

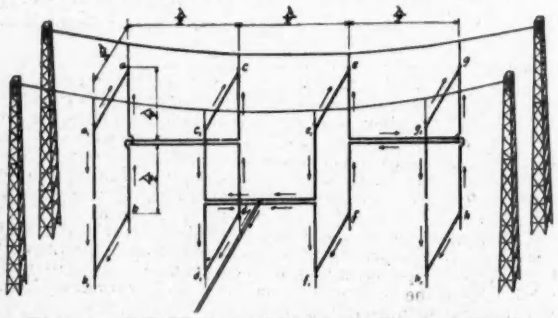


Fig. 4.—"T.W." Aerial, Single Vertical Unit.

more distant portions of the voyage from B to A. The angular positions of both beams are shown in fig. 1.

Aerial Arrays.—In order to radiate a given wave directionally aerial wires, spaced at separating distances corresponding to calculated fractions of the wavelength, are arranged horizontally or vertically and supplied with high-frequency current. When correctly spaced, the fields due to the various radiators add together vectorially, and in this way the resultant field strength in different directions can be effectively controlled. Thus, by using an array in preference to the single-wire aerial, the distant field strength can be increased more than fourfold, and it may be increased further in the desired direction by suppressing the field in the opposite direction, thereby obtaining an effect analogous to reflection, by placing a curtain of similar wires one quarter of a wavelength behind the excited curtain. The currents induced in the reflector wires lag approximately three quadrants (270 deg.) behind the currents in the excited wires. Owing to this phase difference and to the quarter-wave space displacement between the excited and reflector curtains, the

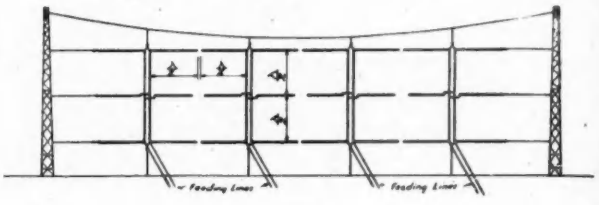


Fig. 5.—Kooman Aerial.

forward fields in a direction normal to the array will be 360 deg. apart, and therefore in phase, whilst the backward fields will be 180 deg. apart, and therefore of opposite phase. Thus, if the excited and reflector curtains have equal currents, the forward fields will be doubled, whilst the backward fields will cancel out.

Sketches in diagrammatic form of different types of antennæ arrays, without reflectors, are shown in figs. 2 to 7. The Marconi aerial (fig. 2) utilises groups of single vertical wires five half-waves long, and it is thus harmonically excited; that is, two half-wave loops of current of one sign and three half-wave loops of the other sign are present. By means of two suppressive coils inserted in each wire, the greater part of the radiation due to the two half loops cancels itself in the zigzags of the coils, and is thus absorbed ineffectively, while the radiation of the three half loops of the other sign passes out into the ether. The Kooman aerial (fig. 5) achieves similar results by energising groups of horizontal wires each half a wave long, whilst the Sterba aerial (fig. 3) utilises wires bent in half-wave lengths, with the horizontal half-wave sections so arranged in pairs so as to neutralise each other.

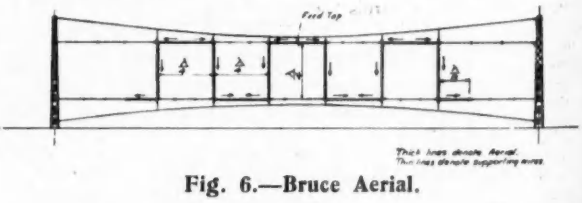


Fig. 6.—Bruce Aerial.

A type of array used extensively as a receiving aerial in the United States, and to a less extent in England, is the Bruce aerial (fig. 6). Each vertical and horizontal member is a quarter of a wavelength long, an exception being made in the case of the two end horizontal members, which are each an eighth of a wavelength long. The arrows indicate conventionally the direction of currents at a particular moment, and show that, whilst the vertical members all have currents in the same direction, the horizontal members have nodes of current at their centres and opposing currents at each side of the nodes. By this arrangement an incoming wave, received from a direction normal to the array, produces currents in correct phase simultaneously in the verticals.

The arrays so far described have had all their exciter wires arranged in one plane. Recently the British Post Office has

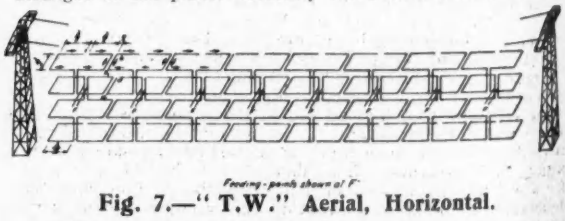


Fig. 7.—"T.W." Aerial, Horizontal.

used an array (fig. 4) having half-wave sections of the exciter wires in two planes, separated half a wavelength from each other. The currents in each plane have therefore a phase difference of 180 deg. in time, plus an equivalent separation in space, and the waves emitted by both are in phase. A reflecting curtain is built a quarter of a wavelength behind one excited curtain and, therefore, three quarters of a wave-

length behind the other. The object of arranging the exciter in two planes is economy in space and cost of the supporting towers. The array is known as the "T.W." aerial (*i.e.*, initials of its inventor, Mr. "Tommy" Walmsley, of the Post Office Engineering Department.

In general, the field strength due to a single-plane array increases with the area enclosed by the boundary radiators, but the "T.W." aerial effects a considerable improvement, as compared with other arrays occupying the same amount of space. It is built up of units of 16 radiators, which can be arranged either vertically (fig. 4) or horizontally. The complete array includes eight such units and is illustrated diagrammatically in fig. 7, which shows the horizontal arrangement of radiators.

(*To be continued.*)

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The Electric Wiring of Buildings.

In your issue of Good Friday, April 18th, you published an unsigned review of my book "The Electric Wiring of Buildings," in the course of which it is stated that the surface accessories described are types which few reputable contractors would use, except for very competitive work, and that I condone the use of conduit tees and sharp bends. I do *not* condone the use of conduit tees and sharp bends, in fact, I condemn them for use in particular positions, clearly defined, in which it is the practice of contractors of first repute to employ them. Neither can I condone the publication of a malicious review, by an anonymous writer, whose sole purpose is obviously to bring discredit upon my professional ability as a consulting engineer specialising in the subject upon which I have written.

Your reviewer does not enumerate the surface accessories described in the book and condemned wholesale as being of types which few reputable contractors would use, except for very competitive work, but he names as instances "raised" ceiling roses (whatever they may be; the term is not used in the book at all), combined sockets and switches, and junction boxes. The porcelain ceiling rose selected for illustration in the book, and very clearly drawn, happens to be the B.E.S.A. pattern, made only by a few leading makers, which is now deemed to be too expensive for general work other than that of the very highest class. The other ceiling rose illustrated is the General Electric Company's bakelite pattern, which has received very favourable notice in your own columns. The two patterns of surface-type combined switches and wall sockets which are illustrated are those made by Tucker's, Crabtree's, and other leading firms, and are both standard patterns employed by leading contractors on high-class work, one of these, the front-entry type, being far from competitive. In addition, the semi-recessed wall socket is suggested as the most useful for general purposes. A split-socket contact is recommended and one of them is illustrated. Hand-shield side-entry plug tops are specified as the pattern that should be used, and the illustrations show the standard B.E.S.A. and the improved Lundberg "Minimax." Coming to junction boxes and conduit boxes, those illustrated are the B.E.S.A. standard "spout" pattern, the box with mounting plate for accessories made by Tucker's and others, and the Henley, Ediswan, General Electric, and Callender "wiring system" junction boxes. Naturally, in my book on electric wiring, space must be accorded to the "competitive" lead-covered wiring, but the impression which the reviewer seeks to convey that first-class methods are ignored and only "very competitive" material described is the reverse of the fact, and deliberately misleading.

The reviewer states that 10-ampere wall sockets are "recommended." This is what is said in the book itself:—

> "There are standardised gauges fixed by the British Engineering Standards Association (B.E.S.A.) for the diameter, centres, and lengths of plugs and sockets, and these should be rigidly adhered to. This British standard gauge should always be specified when ordering, as some makers are still making to different gauges. The standard sizes are 2-amp., 5-amp., 15-amp., and 30-amp."

The reference to non-standard 10-ampere plugs, which is one of the reviewer's excuses for his malignant attack on the book, is contained in a description of a particular installation in which, it is explained, this gauge of plug had been selected for the four vacuum-cleaner points on the landing with the deliberate intention of preventing the vacuum-cleaner being used on lighting wall sockets—in this instance a question of metering and charges. The plan of the wiring layout referred to in this connection is not "given away with the book," but is included in the book itself as one of the illustrations in quite a normal manner.

Your reviewer is good enough to give a qualified approval of one chapter only in the whole book, namely, that devoted to "Calculating the Size of the Conductors," but he considers that reference to Ohm's Law is out of place! He also condemns my use of 200 volts instead of the standard pressure in some of the examples. I do not refer to it as standard pressure, but have merely adopted it as a convenient one in some of the worked-out examples, 200 being easier to use than 230 for the purposes of quick mental arithmetic. If your reviewer will consult published statistics he will find that there are still far more 200-volt connections than 230-volt ones in use in this country.

I need not refer to the insults contained in the first and last paragraphs of your reviewer's malicious attack. His misrepresentations exposed in the first part of this letter will doubtless enable you to admit that you have been seriously misled by him in printing his anonymous attack upon me under the guise of a review of the book in question, but I must further request you to publish an apology signed by the reviewer himself.

F. Charles Raphael.

London, W.C.1. *April 23rd*, 1930.

[We are glad to allow Mr. Raphael an opportunity of stating his point of view. We cannot, however, see upon what possible grounds he construes the review in question as a "malignant" or "malicious" attack.

The professional standing of our reviewer is such as to rule out entirely any question of motive other than that dictated by the duty to place before our readers his considered opinion based upon wide experience. That no personal attack could be intended is evident from the commendatory reference to other work of the author.

Our reviewer gave his reasons for non-agreement with the author, and our readers will be able to decide for themselves whether these are such as to depreciate the value of the book for any specific purposes for which they might require it.—Eds. Elec. Rev.]

The B.E.A.M.A. and the Universities.

Mr. Dunton and others have recently written in your journal on the subject of maxima and minima, and I should like to make the point at issue a little clearer.

The standard definition, namely, that if $f(x)$ has a maximum or minimum at x_0, then $f'(x_0)$ is zero, while $f''(x_0)$ is negative or positive, is correct in a restricted sense, since it may be taken as the definition of a maximum or a minimum. Geometrically such a definition implies that there is a simple tangent with only "two point" contact which is parallel to the axis. This definition is too restricted for physics or engineering since we do not usually care whether the tangent makes a simple or a multiple contact. Accordingly for practical purposes it is more convenient to define a maximum or a minimum by considering the derivative $f^n(x)$ $(n>0)$ which is the lowest derivative having a value different from zero at the point in question. If "n" is odd there is no true maximum or minimum, but there may be a point of inflection. If "n" is even, there is a minimum if $f^n(x)$ is positive and a maximum if negative. Such a rule includes that of Mr. Dunton as a particular case. Mr. Dunton's rule contains the ambiguity that a maximum or minimum is defined in terms of a maximum or minimum of a derivative. From a strictly logical point of view, this is incorrect, although probably of practical utility.

S. Whitehead.

London, W.C.2, *April 25th*, 1930.

Mr G. Windred, in your current issue, says that my researches in engineering mathematics are well known to the majority of investigators, but I feel sure that no one has heard anything of my work from his university professor. Most of these professors would rather continue to give their students the usual wrong teaching than admit that this has been corrected by a non-university man. They are doing so even in a case where the correction was long ago adopted, with due acknowledgments, in America. I know this through having seen the lecture notes of some university students with whom I am now working.

If Mr. Windred understands German (as I think he does), he may soon be able to read my *Steinmetz Vereinfacht*, for which I have been unable to find a publisher in this country. An English publisher, to whom I had been recommended by a well-known writer, was afraid that my contradictions of the customary teaching would arouse the hostility of our universities, and that these would be able to make the book a financial failure. But a Continental editor, after seeing my article on *Les Forces Electromagnétiques* in the R.G.E., has offered to have my manuscripts translated into German and published. I am not saying this with the idea of frightening our university professors. I do not suppose they care how much I teach the Germans, so long as I can be prevented from teaching my own countrymen.

Mr. Windred's letter suggests that he studied either at Oxford or at Cambridge. This would account for his being "unaware of any specific advantage attaching to a study of Steinmetz's writings." As the Oxford and Cambridge professors do not understand Steinmetz, they naturally avoid any mention of problems that particularly call for Steinmetz's method. Yet such problems are of great importance, and of frequent occurrence, in high-voltage engineering. Take, for example, one that I had to deal with quite recently. A

circuit consisted of two inductances, one resistance, and one condenser in series, with one of the inductances shunted by a second condenser, and I had to find what the currents would be when the first condenser was discharged in this circuit. Without the help of what I had learnt from Steinmetz, I could not have solved that problem, and I do not think it could be solved by any university professor who is unfamiliar with Steinmetz's writings.

I admit, however, that the works of Steinmetz are in themselves quite unintelligible. Most of the engineers who use his method do not even pretend to understand it. But this is because "higher algebra," as taught at all our universities, is essentially unintelligible. My chief contribution to electrical engineering is not the "perfection of detail" with which Mr. Windred credits me, but the new view of algebra that causes Steinmetz to become both intelligible and simple.

Still, even if I had found an English publisher for my *Steinmetz Made Easy*, and even if this had been used as a text-book at all our universities, a state of things such as "Cantab." alleges would have spoilt everything. Does such a state of things really exist? It seems incredible that the B.E.A.M.A. can wish to keep its best brain-workers in subordinate and ill-paid positions, and I am anxiously looking forward to see what the B.E.A.M.A. has to say on this matter. I would here draw attention to a serious possibility that "Cantab." appears to have overlooked. If really capable men receive the treatment that he describes, some of them may go to America. They could hardly be blamed for helping another country to beat the one that had treated them so badly. The present great success of America in electrical engineering may be partly due to this sort of thing having happened in the past. The B.E.A.M.A. should do its utmost to prevent such a thing from happening in future.

W. F. Dunton.

Manchester, *April 26th*, 1930.

I heartily endorse the remarks of "Cantab." in your recent issue regarding the poor rate of remuneration of technical graduates in the electrical engineering industry; perhaps my case will be of interest.

After graduating at Cambridge with first-class honours in mechanical science, I served an apprenticeship to the satisfaction of my employers, after which I was offered the munificent salary of £3 a week in London. Needless to say, I refused it, and, after spending a short period with some consulting engineers, drifted into my present position of a buyer, which, incidentally, calls for little or no technical knowledge.

I can, however, live with a fair degree of comfort, but I often regret that I am losing touch with technical progress, and that what knowledge I have accumulated will eventually be lost to the community.

Several of my fellow apprentices have gone to America, where technical brains can earn a living wage. Travelling about the country as I do, I can understand one of the factors that puts us out of competition with the foreigner. I am no pro-American, but until we adopt some of the American principles and pay for brains, not influence, we shall always be behind.

C. A. Kershaw, M.A., B.Sc.(Eng.).

Thornton Heath, Surrey.
April 26th, 1930.

Standardisation of Voltage.

In last week's issue of the Electrical Review there appeared an interesting account of the installation at Madame Tussauds, in which it is stated that the incoming voltage of 6,600 is transformed to 415 volts between phases.

Was there any particular reason for not adopting the B.E.S.A. standard voltage of 400?

The need for voltage standardisation is still very great, to judge by a report in another section of the same issue, where mention is made of the multiplicity of non-standard pressures. The suppression of these is most certainly not helped by new installations, which have the opportunity of coming into line, reverting to non-standard conditions.

This wilful perversion on the part of large private consumers is on a par with that of certain electric motor manufacturers and their attitude to frequency change-over schemes, for which they are supplying special dual-frequency motors, which are non-standard, although the paramount object of the change-over is standardisation.

This diversity of misguided effort must also be very distressing to the Electrical Development Association, as it undoubtedly impedes its good work.

Edwun.

April 27th, 1930.

Australian Standardisation.

Mr. T. R. Martin's letter in your issue of February 7th was discussed here by a number of English-trained sales executives. Their observations on this matter may be of interest to your readers, especially when all concerned are sympathetic to British goods (a large field exists despite the tariff).

Mr. Martin admits that there is little to choose between the performance of the round (English) and the flat (American) 2-pin plugs. The Standards Association would be wise to select the type that is likely to become the most popular; therefore it would choose the flat pin. The reason has been told time and again, and Mr. Martin states it—propaganda and sales effort. Vast information is obtainable from American factories, such as sales talks, tests unlimited, catalogues over-printed, printing blocks, advertisement lay-outs, window-dressing designs and material, films to assist the salesman, follow up letters—blood, fire, and energy.

When sales help is asked for from home manufacturers, the result is nearly always "We consider you should" . . . &c., regardless of the fact that the asking for it was home sentiment—it can be obtained elsewhere.

Excluding Australian-made ones, practically all household appliances, such as washers, vacuum cleaners, floor polishers, ironers, &c., are American-made and shipped complete with 2-pin plugs (flat), and most stoves (Canadian made) have a spare socket, 2-pin flat. The advertisements and the visiting overseas representatives are probably ten to one against. It is not the 2-pin plug that need cause any concern. It would be exceedingly strange if all foreign appliances used in Australia were fitted with English 2-pin plugs.

In conclusion, why labour the obvious? Any British Trade Commissioner's report will furnish a remedy which is far wider than any 2-pin plug.

A. Kenneth Wilson.

Melbourne, Australia.
March 21st, 1930.

Competition.

Having read the article under the above heading by Mr. H. R. Taunton, the writer wishes to express his appreciation of Mr. Taunton's outspoken remarks, and to give the following particulars of a recent job quoted for the re-cabling, also tubing and wiring, of many blocks of "Central Homes" belonging to a well-known eastern municipal area. Twenty contractors quoted—we do not know how many others looked at the job and left it—the lowest price being £2,770; eleven others varied between £3,085 and £3,967, five between £4,023 and £4,457, the three others were above £5,000.

In considering the figures there were provisional sums of £500 and £250 for special fittings to be allowed in the estimates as a minimum; £1,000 would be the cost of 4-core and twin paper-insulated cable with wood troughing, as called for by the specification. In addition to which there was the equivalent of 3,000 ft. run of trenching 2 ft. deep, 18 in. wide, to be cut, filled, and reinstated through varying ground ranging from concrete top, tarmac, to garden earth. This item alone would account for £1,000 if carried out to specification. In addition to which there were cable boxes, main switches, fuse-boards, distributors, the tubing and re-wiring in screwed barrel of 400 points in different blocks, 100 of which had to be completely sunk, and the prices to include all such cutting away, making good, &c.

In our opinion, at a figure of £4,000 the successful contractor would only be covering his net cost on the job, excluding the provisionals already indicated of £750; therefore it is obvious that our quotation was near the top, at which we were not altogether surprised. Having had something like 30 years' experience in the contracting industry, and not wishing to make the acquaintance of Carey Street, we only occasionally take the trouble of wasting our time on this class of work. We are not aware whether the contract has been placed yet or if C.M.A. cables (as in the specification) are put forward by the lower quotations. We have heard rumours that "non-ring" cables are suggested, but we do not think that this would give much advantage.

Perhaps Mr. Taunton's consultant friend in his remark regarding extras gives the true explanation of some of the quotations, but in my firm's case we endeavour to avoid extras and base our quotations on a fair and honest expectation of actual costing without "snags."

One of the Nineteen Time Wasters.

April 22nd, 1930.

The article on "Competition" contributed by Mr. H. R. Taunton in your issue of April 18th appears to blame the electrical contractor only for insensate competition, and possibly deservedly so, but I suggest that he is not alone. It appears to me that the manufacturers and wholesalers are not blameless, for they compete even more fiercely, and cut prices to get orders from a contractor, "or any apology for one," without having due regard to his ability to pay; this can be seen in certain weekly publications. How frequently one hears of contracts being placed at prices which in some cases little more than cover the cost of material specified, while in others very little is left for overhead charges and nothing for profit; yet orders for the materials are eagerly sought after from the successful (?) contractor, until the Official Receiver appears on the scene, and then in some cases they will trust the foreman or any successor. Municipal authorities are also not blameless. Quite recently a case has come to my notice of a large and very well-known firm of motor manufacturers who have quoted special terms "reputed to be less than cost" to a certain supply authority for a motor contract; this authority in turn quoted a price to a user for a small motor well under £20, which was a lower

one than the same manufacturers quoted to an old-established contractor for the self-same motor, and, further, it offered 5 per cent. for cash. Is competition by electrical contractors worse than this? And who reaps the benefit? Certainly not the manufacturer nor the installer, and it is very doubtful about the supply authority. The industry simply prevents well-earned money coming into it, and I believe that practically the same amount of work would be done, and the same amount of electricity demanded were fair and equitable prices charged, instead of the ridiculously low ones which are now so common.

I am somewhat of an optimistic turn of mind, I believe that where there's a will there's a way, and I suggest that if the manufacturers, wholesalers, municipal supply engineers, and contractors would appoint a representative committee to get together with the definite object of eliminating this cut-throat competition from the industry it could be done. I admit that there are a number of units in each section, whose only concern is their own particular business, but I believe these could be dealt with quite satisfactorily; in any case they should not be allowed to completely block the road of progress.

Is there a magnet in the industry sufficiently powerful to draw representatives from the various associations in each section to meet and collaborate with a view to formulating and obtaining adherence to sound and fair trading conditions in the industry? If there is, let him try his strength; it is a goal well worth trying for, and it is the work of the whole industry, and not of any one section only.

As I propose to take certain action in the case referred to I enclose my card and sign myself simply

Optimist.

April 21st, 1930.

Synchronised Time.

We are much interested in the letter of "Synchronised" in your current issue, and would refer him to the article which appeared in your issue of November 22nd, 1929, describing the method of frequency control used by the London Power Co., employing one of our Warren master frequency meters in each of its four power stations, the control being centralised at Ergon House.

Most of the other important supply authorities in London are likewise regulating their frequency to within a few seconds per day, so that it may be said that at the present moment the majority of the houses in London and its immediate suburbs which have alternating-current supplies can obtain accurate time "on tap," so to say, from the nearest wall plug in any room.

Supply authorities in the provinces are rapidly following suit, and the general interlinking of systems by means of the grid is making it more and more necessary for them to do so.

It would occupy too much of your valuable space were we to include a list of the areas involved, but we shall always be happy to advise anyone on this point, if he cares to communicate with us.

Everett, Edgcumbe & Co., Ltd.

London, S.W.1, *April 28th*, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

28,085. "Electric switches of the press-button type." C. Greter. April 17th, 1928. (309,903.)

28,332. "Recording microphones and like apparatus." A. F. Sykes. October 3rd, 1928. (327,410.)

31,812. "Electric high-tension switching apparatus." Condit Electrical Manufacturing Corporation. December 13th, 1927. (302,273.)

32,250. "Circuit arrangements for amplifying electric oscillations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). November 5th, 1928. (327,433.)

35,360. "Electric heaters." O. L. Peard, S. M. Peard, and A. F. Harrison. November 30th, 1928. (327,383.)

35,466. "Electron discharge devices having cathodes heated by alternating electric current." Siemens & Halske Akt. Ges. December 2nd, 1927. (301,514.)

35,785. "Telephone installations." Siemens & Halske Akt. Ges. June 22nd, 1928. (314,041.)

35,928. "Signalling arrangement in which switching is automatically effected by street vehicles." A. Sternberg. December 5th, 1927. (301,809.)

36,367. "Electric heating apparatus and resistance units therefor." Young, Osmond & Young, Ltd., and D. G. Petrie. December 10th, 1928. (327,304.)

36,454. "Resistance units and electric heating apparatus comprising the same." Young, Osmond & Young, Ltd., and D. G. Petrie. December 10th, 1928. (327,392.)

36,392. "Radiators for transformer and other like tanks." British Electric Transformer Co., Ltd., and J. L. Thompson. December 29th, 1928. (327,396.)

36,421. "Prime-mover control systems." British Thomson-Houston Co., Ltd. December 29th, 1927. (303,182.)

36,563. "Electric switching apparatus." British Thomson-Houston Co., Ltd. December 31st, 1927. (303,383.)

38,567. "Electric switches for controlling light and other circuits on motor vehicles." H. E. Kavanaugh. December 31st, 1928. (327,401.)

1929.

9. "Increasing the frequency of electric oscillations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). January 1st, 1929. (327,425.)

118. "Regulation of the starting potential of electrical machines connected up through booster transformers." Siemens-Schuckertwerke Akt. Ges. February 23rd, 1928. (306,529.)

375. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. January 4th, 1929. (327,449.)

537. "Lighting and ignition apparatus for motor-driven vehicles." British Thomson-Houston Co., Ltd., C. J. Morton, and T. H. Woodfield. January 7th, 1929. (327,453.)

608. "Regulators for controlling the speed of electric motors." Electrical Research Products, Inc. June 29th, 1928. (Addition to 292,528.) (314,511.)

634. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and W. A. Duff. January 7th, 1929. (327,461.)

871. "Arc electrodes for use in therapeutic treatment." W. G. Moore. January 10th, 1929. (Cognate application, 22,351/29.) (327,464.)

958. "Portable radio receivers and the like." H. J. Round. January 10th, 1929. (327,467.)

959. "Loud-speakers and the like electro-acoustic devices." H. J. Round. January 10th, 1929. (327,468.)

1,072. "Process for the manufacture of porous bodies, more particularly of diaphragms for electro-osmotic purposes." Siemens & Halske Akt. Ges. January 28th, 1928. (305,022.)

1,158. "Electric train-lighting system." C. Lorenz Akt. Ges. January 26th, 1928. (304,768.)

1,294. "Amplifiers for photo-electric currents." D. von Mihaly. January 14th, 1929. (327,475.)

1,413. "Control systems for elevators, hoists, and the like." Associated Electrical Industries, Ltd. January 16th, 1928. (304,206.)

1,647. "Electric lighting fittings." Engineering and Lighting Equipment Co., Ltd., and W. Bird. January 17th, 1929. (327,480.)

2,588. "Electric connector plugs." Baron Marks (Belden Manufacturing Co.). January 25th, 1929. (327,487.)

3,589. "Means for electrically connecting together electric heaters." Young, Osmond & Young, Ltd., and C. C. Turner. February 2nd, 1929. (327,499.)

3,661. "Electric battery-charging systems." English Electric Co., Ltd., and W. Donnelly. February 4th, 1929. (327,500.)

3,746. "Automatic selecting circuits for telephony." Soc. Nouvelle des Constructions Téléphoniques (Brevets Tchoubritch Derval). March 21st, 1928. (308,296.)

4,056. "Electric candle." C. Harvey (trading as C. Harvey & Co.). February 7th, 1929. (327,504.)

5,054. "Holders for thermionic valves." H. T. Logan. February 14th, 1929. (327,511.)

5,654. "Electric fuses." Ceag, Ltd., and R. J. Plummer. February 20th, 1929. (327,518.)

5,774. "Mechanical drive and coupling for dynamo-electric generators." S. G. Frost. February 21st, 1929. (327,520.)

6,145. "Electric stoves." B. H. Stone. February 25th, 1929. (327,523.)

6,241. "Method of improving the efficiency of antennæ or aerial systems used for the purposes of wireless telegraphy, telephony, picture transmission, television, and the like." C. Miles. February 26th, 1929. (327,524.)

6,381. "Dynamo-electric machinery." R. E. Hopkins. February 27th, 1929. (327,525.)

6,885. "Arrangement for the electrical indication or registration of measuring values." Siemens & Halske Akt. Ges. March 29th, 1928. (308,787.)

6,903. "Electric dimmer switches." M. Rooke and V. F. S. Dunton. March 4th, 1929. (327,535.)

7,001. "Electric motors with reciprocating armatures." M. Juillerat. July 30th, 1928. (316,541.)

7,258. "Vehicle head lamps." W. H. Lund and W. C. Howard. March 6th, 1929. (Addition to 288,898.) (Cognate applications, 25,146/29 and 29,414/29.) (327,540.)

8,160. "High-tension electric cables." Felten & Guilleaume Carlswerk Akt. Ges. March 22nd, 1928. (308,349.)

8,170. "Automatic and semi-automatic telephone systems." Siemens Bros. and Co., Ltd., C. L. Peters, and D. A. Christian. March 13th, 1929. (327,550.)

8,853. "Contact tubes of electrical connectors, wall sockets, and the like." A. P. Lundberg & Sons, Ltd., G. C. Lundberg, P. A. Lundberg and G. Pegg. March 19th, 1929. (327,553.)

9,851. "Telegraphic systems." C. E. Verdan. March 27th, 1928. (Addition to 235,193.) (308,734.)

9,957. "High-tension electric cables with paper insulation." M. Weiset. June 16th, 1928. (313,590.)

10,028. "Shadowless electric lighting apparatus." General Electric Co., Ltd., and J. G. Christopher. March 28th, 1929. (327,563.)

10,306. "Apparatus for performing electrometric volumetric analysis." I. G. Farbenindustrie Akt. Ges. April 3rd, 1928. (309,038.)

12,224. "Operation of a plurality of adjustable members, more especially applicable to wireless receivers." F. Savove. April 20th, 1928. (310,050.)

12,335. "Electric lampholders." A. P. Lundberg & Sons, Ltd., and G. Pegg. April 20th, 1929. (327,591.)

12,740. "Electric arc lamps with rotating flames." G. Gautier, L. Le Bozec and R. Dubois. May 5th, 1928. (310,963.)

12,929. "Electric water-level indicators for boilers." P. Pairard. April 25th, 1929. (327,597.)

13,941. "Electric frequency changers." International General Electric Co., Inc. May 4th, 1928. (310,974.)

14,037. "Electrical accumulator charging plant." Villiers Engineering Co., Ltd., F. Pountney, and F. J. Gray. May 6th, 1929. (327,608.)

14,267. "Electric motors without casings for building into other machines or apparatus." Siemens-Schuckertwerke Akt. Ges. June 12th, 1928. (Addition to 311,732.) (313,488.)

14,542. "Circuit arrangement for repeating current impulses in telephone systems." Telefonaktiebolaget L. M. Ericsson. May 12th, 1928. (311,410.)

14,817. "High-tension electric cables." Soc. Italiana Pirelli and L. Emanueli. May 11th, 1929. (327,614.)

15,262. "Electric plug-and-socket connections." Revo Electric Co., Ltd., F. H. Reeves, and S. F. Bickell. May 16th, 1929. (327,618.)

16,691. "Electrolyser for separation of tin from tin salt solutions." L. Ughetti-La Corsa. June 9th, 1928. (313,166.)

17,192. "Electric switch mechanism and the mounting of such mechanism in boxes, cases, and the like." J. A. Crabtree. March 1st, 1929. (Divided application on 321,428.) (327,632.)

17,810. "Telephone systems." Siemens & Halske Akt. Ges. June 23rd, 1928. (314,065.)

18,475. "Cooling of sparking plugs." J. Franquet and N. Dziacos. June 16th, 1928. (313,623.)

19,493. "Radio and the like valve transmitters." Telefunken Ges. für Drahtlose Telegraphie. June 30th, 1928. (314,534.)

21,501. "Electric transformers." British Thomson-Houston Co., Ltd. July 12th, 1928. (315,372.)

21,510. "Connecting sleeves for lead cables." Siemens-Schuckertwerke Akt. Ges. July 14th, 1928. (315,420.)

24,281. "Methods of manufacturing electric condensers." Elektricitäts Akt. Ges. Hydrawerk. August 9th, 1928. (317,056.)

24,665. "Electric water heaters." L. M. McLeod. August 13th, 1929. (327,658.)

28,968. "Spark plugs." A. C. Spark Plug Co. November 5th, 1928 (327,666.)

1930.

8,974. "Electric draw-out switchgear." British Thomson-Houston Co., Ltd. December 31st, 1927. (Divided application on 303,383.) (327,416.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ASFORDBY (Melton Mowbray).—Additional 50 houses for the Stanton Ironworks Co., Ltd.

AYR.—Housing scheme (80), Newton; burgh surveyor. Picture house and tea rooms (£25,000); George Green, Ltd., Glasgow. County Council offices (£116,000); A. Mair, architect, Ayr. Annexe to Irvine Royal Academy (£20,000); the principal, Pavilion and Council chambers, Troon (£30,000); J. Miller, architect, Glasgow. Post office and telephone exchange, Troon; H.M. Office of Works, Edinburgh.

BECKENHAM.—Congregational Church, Elmers End; Herbert Ibberson, architect.

BEXLEY.—Houses (44), Summerhill Road, for W. Grubb. Houses (48), Pickford Lane, for D. C. Bowyer. Houses (32), Loos Avenue, Bellegrove, for R. Perfect. Church and hall for Bexley Heath Parochial Council; vicar.

BICESTER.—Housing scheme (30) for the U.D.C.; surveyor.

BIRKENHEAD.—Extensions, Temple Road schools, for the borough E.C.; R. W. Johnston, education architect (returnable deposit of £1 1s.).

BIRMINGHAM.—Library, Shirley Road, Acocks Green; H. H. Humphreys, city engineer, Council House. Bank, Hall Green, for the National Provincial Bank, Ltd.; De Lacy-Aherne, architect, 5, Waterloo Street.

BLACKBURN.—Housing schemes, Teak Street (96), and Burnley Road (149 and shops); H. M. Webb, borough engineer.

BLYTH.—Re-erection of school (£20,000) for the borough E.C.

BOGNOR REGIS.—Rebuilding Cambridge House children's convalescent home; Sir Jeremiah Colman, Gatton Park, Surrey, donor.

BOLTON.—Market, offices, &c., Blackhorse Street site (£100,000); borough engineer, Town Hall.

BOSTON.—Electric lighting installation, Fever Hospital, for the T.C.; borough surveyor.

BOURNEMOUTH.—Extensions, municipal offices; borough engineer. Extensions, West Hants. Hospital; governors.

BRIGG.—Housing scheme (30), Mill Lane; E. Priestley, builder, Lincoln.

BROMBOROUGH.—Cinema, Allfoot Lane; G. B. Studding, builder.

CALNE.—Factory, Church Street, for C. & T. Harris (Calne), Ltd.; Mr. Washington, architect.

CATERHAM AND WARLINGHAM.—Houses (36), Stafford Road, for the U.D.C.; surveyor (returnable deposit of £3 3s.).

CATTERICK.—Officers' quarters and mess (£10,000); Dougill and Son, builders, Darlington.

CHELL (Staffs.).—Houses (170); Chatterley-Whitfield Collieries, Ltd.

CHESHIRE.—Schools, Great Broughton (640 places) and Kingley, Runcorn, for Cheshire E.C.; R. Potts, clerk, Chester.

CHIPPING NORTON.—Housing scheme (48) for the R.D.C.; S. P. Bendle, surveyor, Charlbury (returnable deposit of £3 3s.).

CHORLEY.—Three elementary schools for the E.C.

DAGENHAM.—Additional 609 houses, Eastbrook End Road, for the U.D.C.; surveyor.

DARWEN.—Premises, Market Street, for F. W. Woolworth and Co., Ltd.; W. Priddle, architect, Victory House, Kingsway, London, W.C.2.

DUDLEY.—Schools, Priory estate (400 places), and Brewery Field estate (320 places); J. Whaley, director of education, Education Offices, St. James Road.

EAST SUSSEX.—Secondary schools, Hove, for East Sussex E.C.; J. H. Baines, director of education, Lewes.

EDINBURGH.—Extensions, Royal Infirmary; Master of Works. Reconstruction of Huntly House as City Museum; city architect.

FIFESHIRE.—Garage for 30 'buses, with waiting room, &c., for Simpsons & Forresters, Ltd., Lochgelly; the manager.

GLASGOW.—Houses (156), Gairbraid estate (£37,550); John M'Donald (Contractors), Ltd. Two schools, Carntyne and Campbell estate, for the E.C.

GODMANCHESTER.—Housing scheme (32) for the T.C.; borough surveyor.

GRAYS.—Cinema; Frank Matcham & Co.

HAYWARDS HEATH.—Public offices, &c., for the U.D.C.; surveyor.

HERTFORDSHIRE.—Schools, Welwyn Garden City, Letchworth, Hoddesdon, and Baldock, for Herts. E.C.; director of education, Hertford.

HIGH WYCOMBE.—Housing scheme (148) for the R.D.C.; C. H. Wright, architect, 24, Temple Street, Aylesbury (returnable deposit of £2).

HINCKLEY.—Aerodrome; surveyor to U.D.C.

HULL.—Technical college; R. C. Moore, director of education. Garage for 200 cars, Dock Basin, for the T.C.; city engineer.

INCE (Lancs.).—Additional 140 houses for the U.D.C.; surveyor.

ISLE OF ELY.—Schools, March, Chatteris, and Christchurch, for Isle of Ely E.C.; E. J. P. Osborne, director of education.

KENT.—Schools, Sutton Valence, Northfleet, and Hythe, for Kent E.C.; E. Salter Davies, director of education, Maidstone.

KETTERING.—Houses (200) for the U.D.C.; surveyor.

KIDDERMINSTER.—Cinema, Oxford Street; Webb and Gray, architects.

LANCASHIRE.—Schools, Urmston (£48,500), Thornton Cleveleys (£35,000), Irlam (£26,000), Oswaldtwistle (£28,000), Poulton-le-Fylde (£22,000), Culcheth Newchurch (£21,000), and Prestwick. Extensions, Hutton Grammar School (£32,000); and school clinic, Earleston, for the Lancashire E.C.

LEAMINGTON.—Cinema; H. C. Bradley, architect, 10a, Temple Street, Birmingham.

LEICESTER.—Factory premises, Charles Street, for Kendall and Co.; C. Lawton Brown & Percy Jones, architects, 4, Market Place.

LIVERPOOL.—Crown Hotel, Stopgate Lane (£14,500), for Bents Brewery Co., Ltd. Heath Hotel, Allerton; manager.

LONDON (East Ham, E.).—Employment exchange for H.M. Office of Works, King Charles Street, S.W.

(Poplar, E.).—Extensions to works of Allen-Liversidge, Ltd.; E. L. Mason.

(W.C.).—Extensions, St. Peter's Hospital, Henrietta Street (£25,000); H. Edmund Matthews, architect. Block of offices, Red Lion Street and High Holborn; Angell and Curtis, architects, 133, Regent Street, W.1.

OSWESTRY.—Alterations, King's Theatre; H. C. Bradley, architect, 10a, Temple Row, Birmingham.

OXFORD.—Municipal buildings, Carfax (£18,000); H. V. Ashley & Winton Newman, architects.

PLYMOUTH.—Cinema theatre and café; Mr. Hammick, architect, 63, Old Street.

PRESTON.—Reconstruction of pumping and sewage disposal works; borough engineer.

ROTHERHAM.—Wesleyan Reform Union Church for trustees. Powbroom Wesleyan Reform Union Mission.

ST. HELENS.—Extension of hospital; secretary.

SHEFFIELD.—Library and art gallery; city architect.

SHELTON (Staffs.).—Development, Caledonia estate; W. Campbell & Sons, architects, Hanley.

SMETHWICK.—Boys' secondary school (£49,500) for the borough E.C.; director of education.

STIRLING.—Additions, Station Hotel, including dining hall and ballroom for 500 people; James Miller, architect, Stirling.

SWADLINCOTE.—Town hall, covered market, &c., for the U.D.C.; surveyor.

TUNSTALL.—Houses (50), off King William Street; Nixon and Beckett.

USHAW MOOR (Co. Durham).—R.C. church; Rev. Father Shelley.

WARWICKSHIRE.—School, Rugby, for Warwickshire E.C.; education architect, Warwick.

WESTON-SUPER-MARE.—Bazaar premises, High Street, for Marks & Spencer, Ltd., 21, Chiswell Street, London, E.C.

WOLSTANTON (Staffs.).—Houses (50), Moreton estate; H. Beckett.

WYCOMBE.—Houses (100); C. H. Wright.